TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

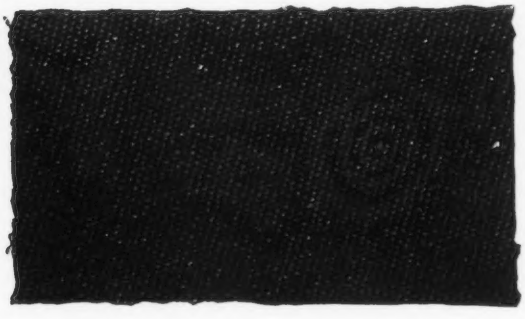
Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XII OCTOBER 22, 1923 NUMBER 22

GEIGY COMPANY, Inc.

89-91 Barclay Street, New York City

ANILINE COLORS



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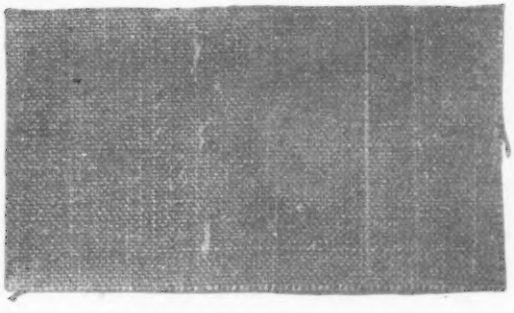

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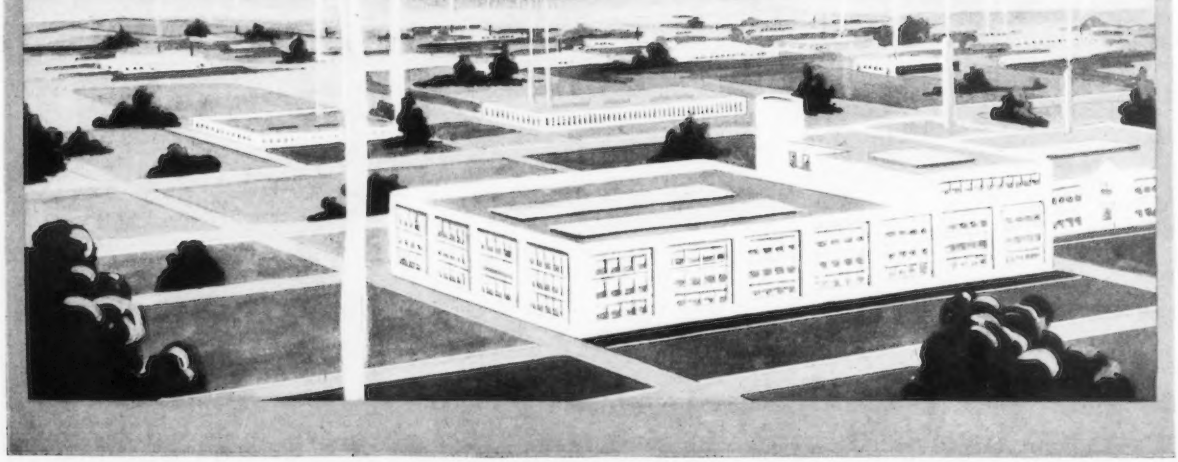

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Which Is the Most Economical to Wind— A Skein or a Package?

ABSURD as this question may seem to you, we are nevertheless frequently obliged to put it to experienced textile men, simply because they have been too busy to take even the small amount of time required to discover the fundamental advantage of Franklin Process dyeing over other methods.

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Skein dyeing requires winding from skein to spool after dyeing. Franklin dyeing requires winding from tube to package before dyeing. To wind from tube to package requires less time than from dyed skeins to spools, and the waste in the former process is far less, in fact practically negligible. This saving alone, whether you or the dyers do the winding, makes the Franklin Process worthy of your careful investigation.

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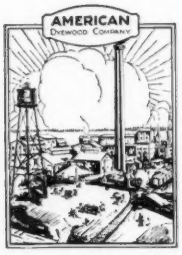

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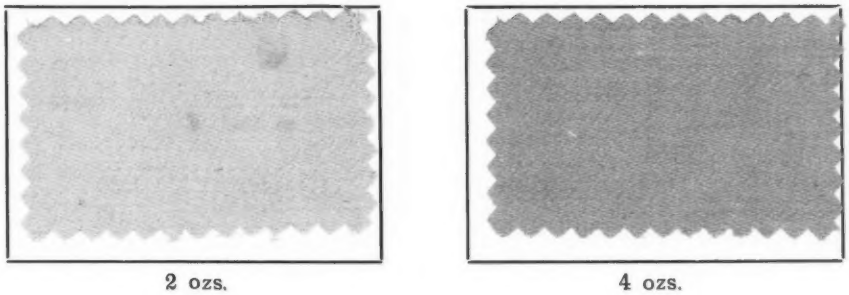

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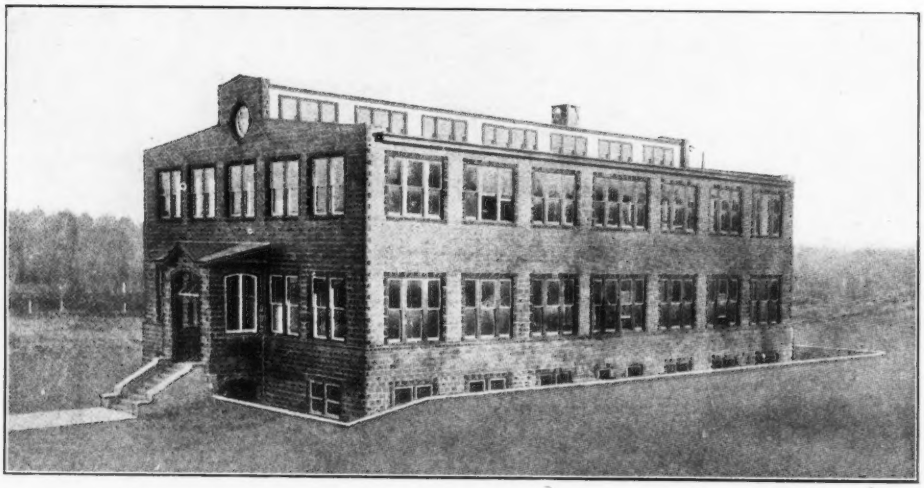

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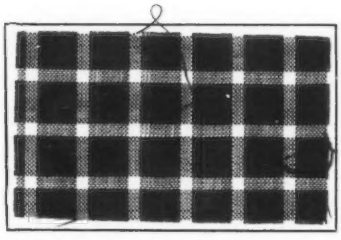

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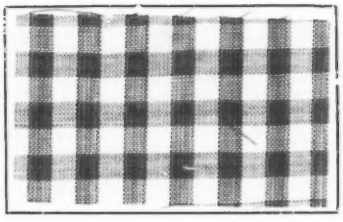

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Ponsol Yellow G
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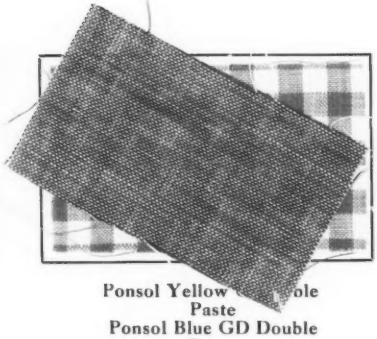

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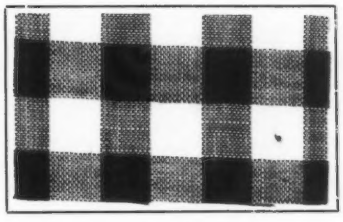
Ponsol Blue GD Double
Paste



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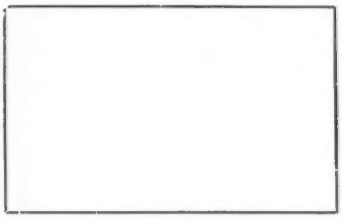
and
Du Pont Naphthanil Red
G Base



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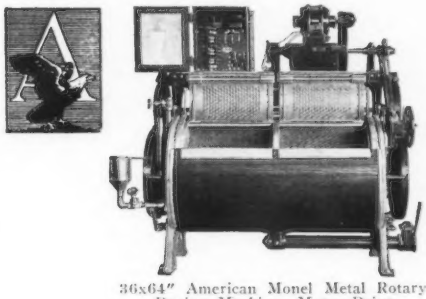

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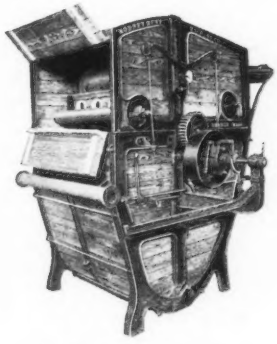

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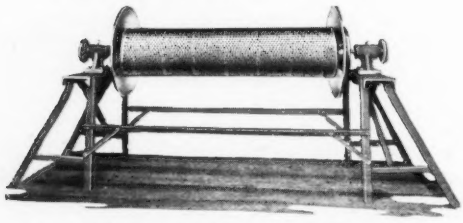

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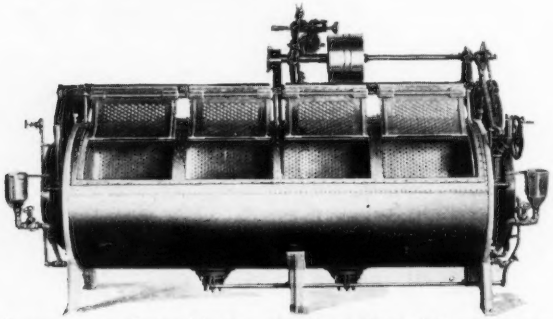

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Plugs and Seats
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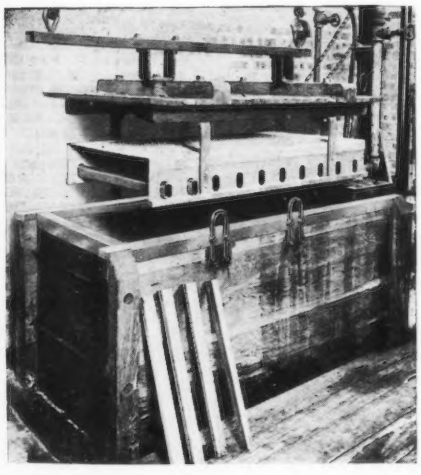

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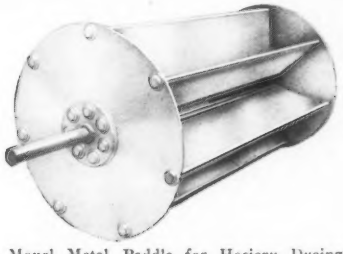

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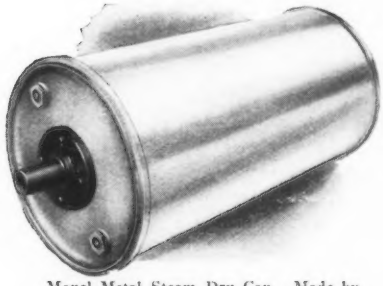

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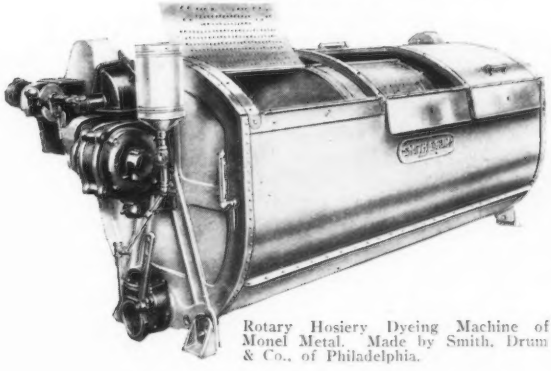

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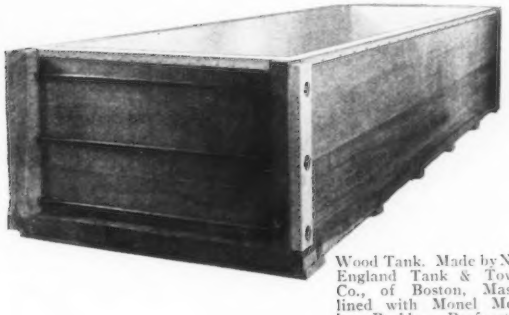

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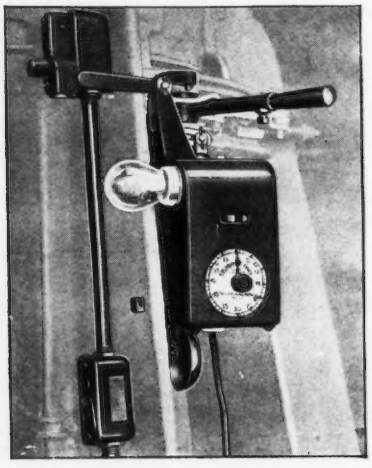
metal



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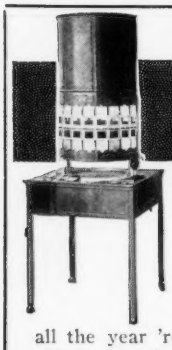

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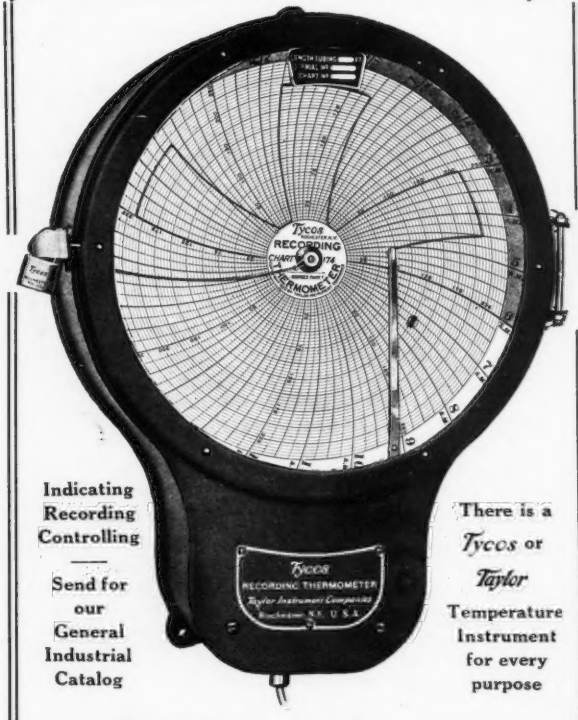

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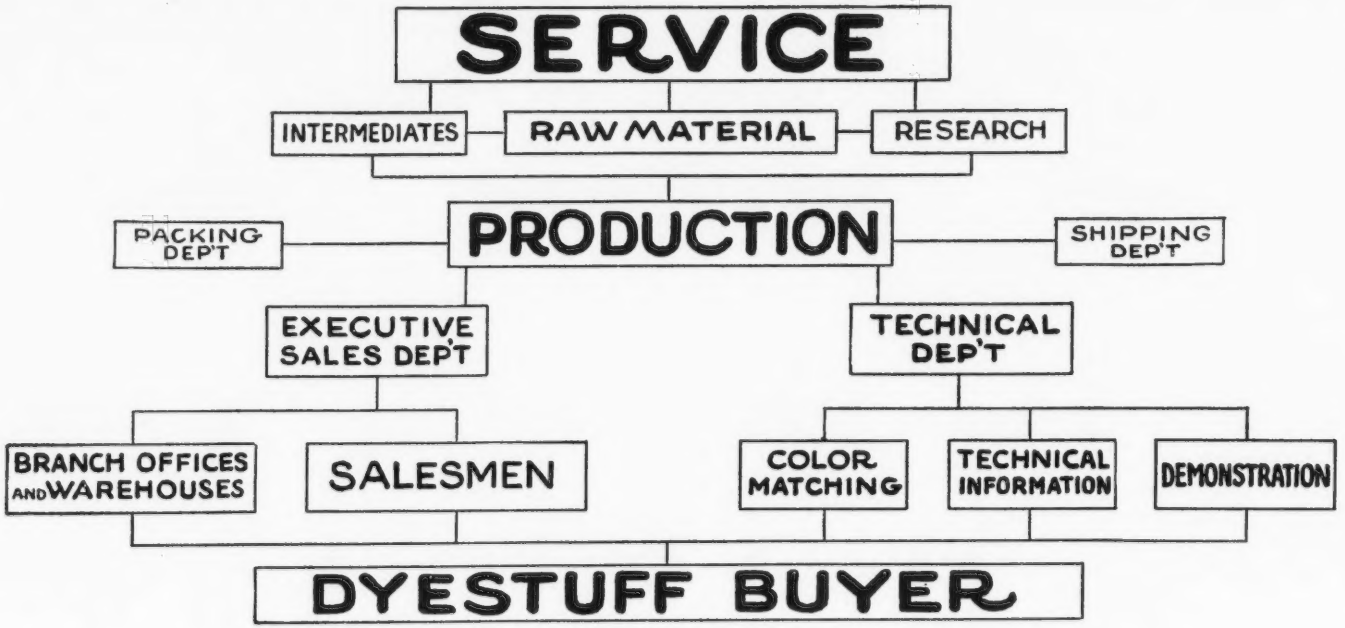

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Some Phases of Cotton Piece Goods Dyeing

Padder Dyeing—Preparation of Cloth—Construction of Padders—Pad Dyeing and Starching—Suitable Dyestuffs Available—Jig Dyeing—Various Types of Jigs—General Precautions

By JOHN F. WARNER

Superintendent, Bronx Company, New York City

THE dyeing of cotton cloth "in the piece," or, in other words, after the fiber has been spun into yarn and then woven into cloth, promises to become an increasingly important branch of the textile industry. The war, with its sudden demand for immense quantities of colored cotton fabrics for military purposes, supplied the industry with the impetus needed to carry on the research work which had formerly been done principally by the larger foreign dyestuff manufacturers. Likewise in the years just preceding 1914 the dyestuff makers had placed on the market various classes of dyes which represented the achievements of their chemists in producing colors of easy application to cotton piece goods, yet possessing fastness properties which formerly had been obtainable only on raw stock and yarn through expensive and involved processes.

It is the purpose of this article to describe some of the methods in use in the modern piece-goods dyehouse. These represent in most cases a combination of old-time practices with the continuous process methods developed as a result of war-time activities.

The bulk of all cotton piece goods is dyed on but two types of machine—the padder and the jig. With the exception of a few minor changes in design, these machines have not been improved in many years. This is due to the fact that they are extremely simple and at the same time very efficient. In this paper some of the more important details for the dyer to bear in mind when running pads and jigs will be reviewed. It has been aptly said that the difference between a real good dyer and one of mediocre ability is the difference between the man who is ever watchful of the smallest details of his work and the man who is too busy to give attention to them.

Padder Dyeing—Preparation of Cloth

There is a certain amount of padder work which is not bleached. A large quantity of coarse yarn sheetings has been dyed in this way within the past few years, and while such goods very often show stains they are seldom, if ever, due to the dyehouse. These goods are dyed and finished to imitate woven fabrics, and have been largely used for shirtings, aprons and children's clothing. The desired results are obtained by padding the unbleached cloth through a cold solution of dyestuff. In this way the color goes on the cloth more or less unevenly, and without thoroughly penetrating into the fiber.

Most cotton cloth, however, for padder dyeing in light shades should be bleached to a good white, care being taken that a good "bottom" for the cloth has been obtained, in order to prevent streaks and stains in the cloth. Such stains, or "resists," may often be caused by imperfect kier boiling which does not remove all of the original waxes and sizes. Stains of this sort are very difficult to remove and, in fact, often render the cloth unmerchantable. In some cases several passages through a weak solution of hydrochloric acid will clear the fabric, or in severe cases a further boil with caustic soda or soap may help. Resist stains on fine mercerized cloth for dyeing may sometimes be traced to insufficient scouring while in bleach, although it is the writer's opinion that the most important phase of bleaching for the dyer to study is the kier-boiling, or "bottoming." If the cloth is thoroughly boiled so as to obtain a uniform removal of the natural impurities in the cotton it is quite possible to dispense with the last souring when in bleach.

Another source of trouble from streaks and stains

may be traced to the use of too strong a solution of bleaching powder, resulting in the formation of oxycellulose. Fortunately, through improved methods of bleach liquor control now practised in the modern dye works this defect is rapidly becoming a rare one.

When the stains are due to oxycellulose in the cloth, it will be found that basic colors, such as methylene blue, have a strong attraction for the oxycellulose, while direct dyeing cotton colors, such as benzo-purpurin, have an equally strong repellent action. The intentional production of oxycellulose by a strong solution of bleaching powder has no technical value as an aid to dyeing, however, because the strength of the fiber is considerably diminished in its formation.

Construction of Padders

Padders are of various styles, depending on the class of work handled, but usually consist of two or three rubber or brass bowls, placed one on top of the other, with the bottom one revolving in a trough containing the dye solution. The bowls may be from 8 to 20 inches or more in diameter and the speed of the machine from 40 to 160 yards per minute. The dye box may contain from 12 to 40 gallons of liquor, and is fed from one or more storage tanks placed near by. A closed steam coil should be arranged for in both dye box and storage tanks, to keep the color solution at an even temperature. Trouble experienced with heavy shades running off the correct cast may often be traced to a cooling of the dye liquor, and this may be largely overcome by the use of closed coils.

With bowls of 18 inches or larger, a speed of 120 to 160 yards is not uncommon, the cloth being run from rolls directly into the dye box or from a truck placed far enough from the machine that the cloth may be loosely threaded up before entering the nip. At a high rate of speed the truck must be placed a sufficient distance away to give the operator opportunity to remove any creases which may have been dried in. In batching up after dyeing it is often convenient to make rolls of 1,500 to 3,000 yards, which are taken on a small truck to the drying cans. Here a small block and fall will be found useful to lift the rolls on the stands in front of the dryer.

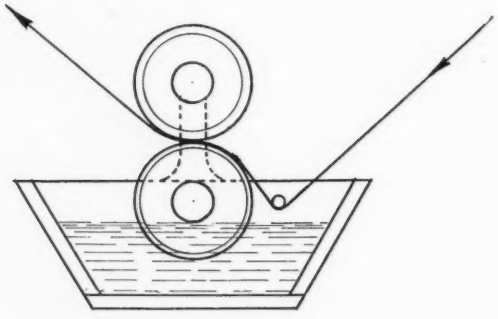


FIG. 1

Dyeing in the padder is accomplished by passing the cloth under one or more rollers in the dye box, and then through the nip, although the arrangement in Fig. 1 may be used for most fabrics.

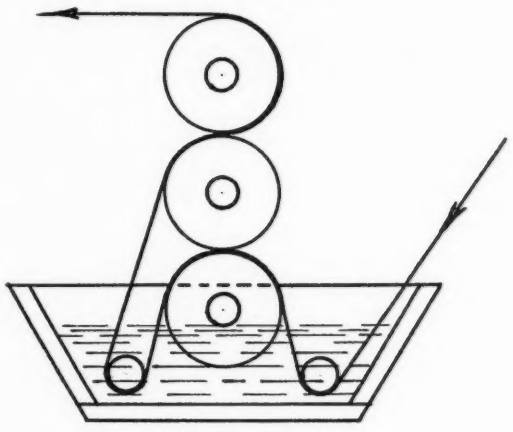


FIG. 2

The object in this case is to pass the cloth under a roller placed about 2 inches above the surface of the dye liquor, in such a way that the cloth will follow the surface of the bottom bowl for about one-fifth its diameter. With this dye box there should be no trouble from dirt or dye specks being drawn onto the cloth, such as is often the case where the cloth passes under a roller in the dye. Heavy twills, drills, sateens, etc., which are not easily penetrated on the ordinary slop padder when run straight through the nip, dye very well in such a box.

A three-bowl padder, consisting of a top and bottom bowls of rubber and a center one of brass and running from 40 to 80 yards per minute, will be found useful for dyeing cloth which might show stains or streakiness if dyed on a faster padder. Such a machine is shown in Fig. 2. The slower speed, with resultant longer immersion in the dye solution, seems to overcome these faults.

Within the past few years it has become the practice to attach drying cylinders to the padders wherever space permitted, and this phase of piece-goods dyeing has many points in its favor. In addition to the time and labor saved in the dyehouse in transporting cloth to and from the drying machinery, the saving in cloth is considerable. It is not unusual to see a waste of 2 to 6 yards on the end of each roll of cloth dyed on a padder, due to stopping the machine when changing and taking off the rolls. When dyed and dried in one operation, the cloth may be delivered in trucks holding several thousand yards each, thus eliminating all wastage due to bad ends and stops. With competition becoming constantly keener, few mill executives will not

bear witness to the fact that their customers are asking for greater returned yardage, and a padder with drying cylinders attached is a means to that end.

Care must be exercised in such an arrangement to see that the first few cans the cloth passes over are not too hot, or a mottled and "blistered" dyeing may result. If possible, the first few cylinders should have a separate steam connection, which will allow the operator to regulate the heat to best advantage. Such machines are best driven by direct-current motors, where a range of motor speed from 10 to 1 is possible. A shunt-field rheostat with a large number of running points will permit ease of adjustment over the normal operating speeds, and shunted armature control will account for the slower "jogging" and "threading" speeds.

A padder with such a motor drive also very often proves useful to the dyer in obtaining the desired depth of shade, since he may speed up if the trial "swatch" is a little too heavy in shade, or slow down slightly if too light, thus giving the cloth a longer or shorter time in the dye solution, as may be required.

Pad Dyeing and Starching

Dyeing and starching in one operation may be successfully accomplished with many grades of cloth on a padder with two or three bowls if carefully supervised, and will effect a great saving in time and labor on any cloth so handled. In this case the dyestuff, previously dissolved in a suitable pail or vat, is added to the starch mix when boiling up same. The amount of starch per gallon should not exceed more than 1½ pounds, as clothing requiring more sizing than this is very apt to appear streaky. The dye box on a padder used for this purpose should have a valve on its bottom. Then, if the trial is not the correct shade the thickened dye liquor may be drawn off and be returned to the mixing tub. By this means a second tub of starch will contain the same amount of color as added to the previous one, and an even run is assured. Best results when dyeing and starching in one operation are obtained by running the cloth under a roller in the dye box, as in this way the cloth is given a uniform wetting. One of the principal requirements of such a machine is that it be so constructed as to be easily cleaned. The pipe feeding the thickened dye solution must be as short as possible, and preferably without sharp bends. The colored starch should be run in at the back of the dye box, so as to be carried around by the bottom bowl, and in this way evenly distributed. A spray pipe is impractical except with very light starch mixes, since the starch will soon clog it. If it becomes necessary to stop the machine for any length of time in the course of a run it is best to wash out the pipes and box before starting up, to avoid spots from the caked starch which, due to cooling, collects immediately.

Suitable Dyestuffs Available

With the large assortment of easily soluble dyestuffs now offered by the American manufacturers, few precautions regarding the dye solution are necessary. The so-called "direct" or "substantive" colors used for practically all padder dyeing are so soluble in water and exhaust so poorly that uneven dyeings seldom occur. Best results with the substantive dyestuffs are obtained when dyeing at a temperature somewhat under the boil. For full shades a temperature of about 160 deg. Fahr. will be found best for general work. Many of the substantive dyes appear to give better results in an alkaline solution, soda ash being the agent usually employed for such a purpose.

Sodium phosphate, a milder alkali, also finds extensive use in padder dyeing, principally for light shades. The chemical action of the alkali in such cases is rather uncertain, but it probably assists in penetration of the cotton fiber by the dyestuff. The addition of common salt or Glauber salt will decrease the solubility of the dyestuff in water and consequently give heavier dyeings. Care must be exercised in the use of salt to keep from precipitating the dyestuff, which occurs when too large an amount is used. Such precipitation, or "salting out," will cause dye specks and unlevel runs of shade. Turkey red oil and soap are often used, particularly when dyeing light shades on fine mercerized cotton cloth and when dyeing at moderate temperatures. The action of the soap or oil is to aid penetration, and in the case of organdies, voiles, etc., for dress goods finishes it is possible the fastness of the material to washing is slightly increased. Few colors besides the "direct" dyes are successfully applied on the padder in the production of mode shades. Basic dyes may be successfully used in very small quantities in combination with the direct dyes or in a separate solution for "topping" the direct dyes to obtain very bright light shades. When used, the basic dyestuff should be dissolved with the aid of acetic or formic acid and the dyeing conducted at a moderate or even cold temperature. Great care must be used to assure perfect solution of the basic dyestuff at all times. In dissolving the basic dyes, cold water should first be added to the dye and the mixture worked up to a thin, smooth paste. Afterward a large amount of boiling water and 1 or 2 per cent of acetic acid will usually bring the color to an easy solution. If boiling water is added to the dry basic dyestuffs many of them form sticky, tar-like lumps which are exceedingly difficult to dissolve.

Without doubt one of the most common faults, if not the most common, found in goods dyed with the basic colors is speckiness, due to minute particles of undissolved dyestuff. It is usually impossible to remove such "dye specks" without entirely discharging the color, and such a treatment, which is of necessity a severe one, is liable to weaken the cloth.

With the large range of direct dyeing cotton colors now available, however, the question of suitable dyestuffs and assistants for the dyer of padder shades is not a vexing one. The best results in shade and production are obtained rather from the machines which are best adapted mechanically to the work required of them.

Jig Dyeing

The present-day dyer finds himself still obliged to turn his "jigs" for the dyeing of many shades which even the finest padders cannot do successfully. This work includes the dyeing of heavy fabrics, such as corduroys, cotton drills and twills, serges and the like, as well as lighter weight cloths to be dyed heavy shades of brown, navy, etc.; also many shades which require after-treatment with metallic salts and various other fixing agents to insure good fastness. Among the latter shades of dyed cotton fabrics may be included drapery fabrics fast to sunlight and washing, washable dress goods cloths to be rubberized, many fabrics which are to be subjected to the action of weather, such as umbrella cloth, awning duck, etc.

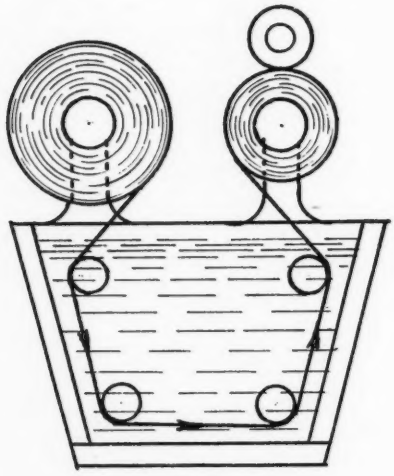


FIG. 3

These are but a few of the many kinds of cotton fabrics which, due to the penetration it is possible to obtain ease of washing, and other numerous advantages, are best dyed on the jig.

Construction of Various Types of Jigs

The ordinary jig, or, as sometimes called, jigger, consists of a dye vat larger at the top than at the bottom, which contains several guide rollers. The size of the dye vat depends on the kind of cloth to be run, the width running up the 90 inches or more and the depth being about 30 inches. Cold water and steam connections are placed within convenient reach of the operator, and in large dyehouses hot water fed from a central tank will save much time otherwise consumed in boiling up the dye liquor between passages of the cloth. Whenever convenient, it is likewise advisable to equip the dye vat with a closed steam coil, which will prevent excessive dilution of the dye liquor with condensed water from the open steam tap. When several additions of dye liquor are made during the passage of the cloth and a large number of passages or "ends" through the dye liquor are required, the volume of water often becomes so great when there is no closed coil as to cause a serious dilution and hamper the dyer in obtaining the correct shade. The cloth is brought to the jig wound on rolls containing the proper number of yards and is passed over the guide rollers onto a roller placed above the surface of the dye liquor. When the jig is started, the cloth is wound back through the liquor, and this operation of passing the cloth back and forth through the dye liquor is repeated until the proper shade is obtained. As soon as the dyeing is finished the roll of cloth is taken from the jig and water-mangled to squeeze out the excess color, and is then ready for oxidation, aging or drying, as the case may be. This type of machine is used for the general run of shades dyed with direct, basic, vat or mordant dyestuff.

For the dyeing of some classes of colors the ordinary jig is best equipped with a squeeze roller. The squeezing arrangement consists of a rubber-coated roller operated with screw and lever pressure and placed on top of one of the drawing rollers, as shown in Fig. 3. This arrangement allows the cloth to be wound on the bottom iron roller while the rubber-coated squeezing roller is pressed upon it. Another somewhat similar type of jig has both drawing rollers arranged with rubber squeezing rollers, thus allowing the cloth to be well squeezed after each passage through the color solution. These machines are used principally for dyeing goods with the sulphide or so-called "sulphur" dyestuffs.

Considerable trouble has always been experienced with many types of sulphur dyestuffs due to their rapid oxidation on exposure to air during dyeing. This oxidation in goods dyed on the jigger is most pronounced at the selvedge of the cloth; and inasmuch as a large percentage of all sulphur-dyed fabrics are narrow twills and drills used in the manufacture of work clothing, these discolored and shaded selvedges mean "dye seconds," which can only be used by the clothing manufacturer at a considerable loss. This is because such fabrics are usually made up by the manufacturer in a manner which utilizes practically the entire width of the cloth. For this reason, as well as because the finished garment is for outside wear, dye seconds are particularly objectionable, and can be disposed of only at a price far below that of first-quality goods.

Although the squeezing jigger reduces this oxidation to a minimum, it has one drawback which the writer

believes has prevented its more general use in this country—viz., low production. Because of existing trade conditions a large production is necessary if a sulphur dyehouse is to operate profitably. In addition, the development by the dyestuff makers of improved types of sulphur colors not so susceptible to oxidation and the rapid strides made by machinery manufacturers specializing on continuous dyeing ranges have helped retard the adoption of the squeezing jigger for piece-goods dyeing.

General Precautions in Jig Dyeing

It often happens that poor results are obtained from jig dyeing because seemingly unimportant details are not given their proper attention. Probably the most common fault found with cloth dyed on the jigs is an unevenness in shade from one roll to another. When the color for each jig has been weighed out and dissolved in an individual pail, such differences are usually laid to inaccuracies of the drug-room clerk in weighing the dyestuffs. While it is true that he is sometimes at fault, more often this trouble is due to one of two things—either the volume of liquor has varied from jig to jig, or the temperature has not been uniform. Both of these conditions may be due to carelessness on the part of the operator, although it is surprising to note the lack of attention paid by many dyehouse superintendents to the steam supply. Unless all exposed steam pipes in the dyehouse are protected by a suitable non-heat-conducting covering, condensation is continually taking place. Hence, after the liquor has been "boiled up" a few times those jigs farthest removed from the steam supply line will have a larger and less concentrated volume of dye liquor. The difference in 25-gallon dye vats in a long string of jigs may amount to from 5 to 15 gallons in the course of several hours' running in cold weather and hence lead to very uneven shades in the various rolls dyed.

Another common cause of trouble comes from leaky steam valves, with a resultant uneven increase in the volume of liquor from jig to jig. Each operator should be trained to report at once any defective valve. While the initial cost of equipping jigs with closed steam coils may be high in comparison with the ordinary open jet, the added protection afforded warrants their more general use.

A third factor which aids in preventing uneven shades from roll to roll is a uniform weight of each roll. The usual method of gauging the size of the jig roll when it is being wound up is by measuring the radius by means of a stick. Because the tension of the cloth on the winder may vary, and hence one roll be tightly wound while another is much "softer," this method is somewhat unreliable. It is much better to equip the winder with a good yardage clock or else weigh each roll before dyeing.

It is important when dyeing heavy shades and shades which are dyed on a mordant bottom to have the selvedge of the cloth wound evenly—i. e., not to allow some laps to project farther from one side of the roll than from the other. Probably the most certain way of overcoming trouble from this source is to wind up the cloth for jigging on a short tenter frame. Such a method practically insures perfectly wound rolls and is being quite generally adopted by large dyehouses. In this case also, while the initial expenditure may appear great, it is soon lost sight of in the better work and larger amount produced.

(To be continued)

The Most Useful Linen Plant

From Stone Age to To-day—From Flax Plant to Line and Tow—Flax for Seed but Still True Linen—Linenizing of Cotton; Now Cottonizing of Linen—War Ups and Downs—Linen Future Is With Chemists and Engineers

By CHARLES F. GOLDTHWAIT

Baltimore Processing Company, Baltimore, Md.

THE most useful linen plant, or *linum usitatissimum*, as its Latin name calls it, has held human interest for many centuries. In the variety of its products and by-products it ranks with cotton. First and most important are the many kinds of linen fabric, thread, twine and cord; then, linen surpasses as a material for fine papers; the linen (or flax) plant furnishes linseed, the best of all paint oils; it supplies insulation board for houses and refrigerator cars; makes tow for stuffing horse collars and parlor furniture; the cakes of crushed seeds serve as cattle feed; and, last but not least, the linseed oil is used in European countries to feed the family.

Linen cloth appears among the oldest of historic relics, and among the most treasured family heirlooms, as well as in the most exclusive shops of the present day. What greater tributes can there be to its durability and beauty?

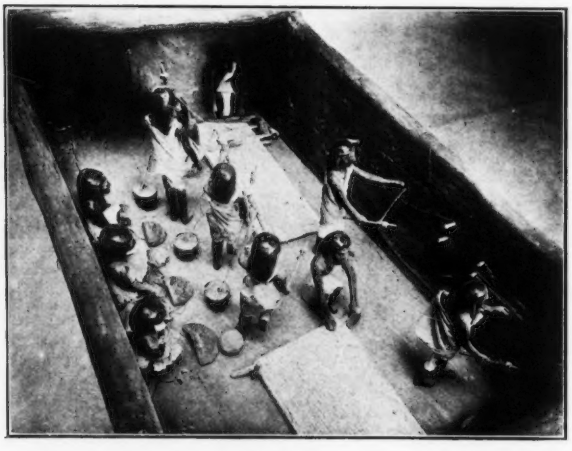
Earliest Use of Linen

History relates that the Neolithic Age began ten or twelve thousand years ago, and, as we learned in

'school, it was characterized by the fashioning of implements of *polished* stone. It also saw the beginnings of agriculture and of plaiting and weaving. Dates are, of course, uncertain for these prehistoric times, and flax may actually have been crudely worked as far back as the Ice Age. This much, however, is established: the Swiss lake dwellers who began life six or seven thousand years ago used at some time during their era both rough cloth and fish-nets of flax that they raised for the purpose. Whatever the date, it establishes linen as apparently the earliest true textile.

More familiar, because there is recorded history, is the use of flax in Egypt as early as 4,500 years ago, for cloth of this age has been preserved to us as mummy wrappings. Although some of the finest of these linens could scarcely have been woven beyond three yards by a single person in a week, such large quantities have been found that it was once seriously discussed in Europe whether the cloth should not all be collected and made up into paper. Hardly a fitting use for the shrouds of kings!

The Egyptians, fortunately for present-day historians and museums, had the peculiar custom of burying with their deceased kings whole collections of small models depicting the activities of the people of their time, with the idea that the little human figures in them would provide for the monarch on his long journey. Mehenkwetre, a great man in those days and nearly a king, had in his collection a group of figures depicting the preparation of flax into thread and linen cloth. This priceless relic of the textile industry of 4,000 years ago now rests in a museum in Cairo. The picture shows three women preparing the flax, three others standing spinning by hand, others putting the threads on pegs on the wall, and finally two weavers. With all this tedious work, no wonder linen was held in high esteem.



Courtesy Metropolitan Museum of Art.

Preparing Flax Four Thousand Years Ago

A Pioneer American Textile

Linen was the pioneer textile in America, as in Europe, and served many purposes in the household. While fortunate in having linen, our forebears deserve a measure of sympathy, for John Burroughs in "My Boyhood" has no doubt related the common experience:

"In my early youth our house linen and our summer shirts and trousers were made from flax that grew upon the farm. Those pioneer shirts, how vividly I remember them. They dated from the stump, and bits of the stump in shape of 'shives' were interwoven in their texture and made the wearer of them an unwilling penitent for weeks, or until use and the washboard subdued them. Peas in your shoes are no worse than 'shives' in your shirt. But those tow shirts stood by you. If you lost your hold in climbing a tree and caught on a limb, your shirt or your linen trousers would hold you. The stuff from which they were made had a history behind it; pulled up by the roots, rotted on the ground, broken with a crackle, flogged with a swingle and drawn through a hatchel, out of all this ordeal came the flax."

This characteristic roughness is a reminder that quite possibly the "sackcloth" so often referred to in the Old Testament in connection with mourning and penitence was a coarse flaxen cloth, and perhaps shive was no unimportant feature of this sturdy material.

The Plant Itself

The flax plant consists of a woody stem of ligno cellulose, surrounded by a layer of fibers which are pectocellulose, and covered by a thin film of "bark" said to be cutocellulose. Someone has very aptly remarked that the single fibers lie "adhesively contiguous" in the bundles that surround the stem. Stated in ordinary English, materials like cotton and wool are composed of single independent hairs, while flax comes from the plant in bundles or ribbons, each made up from many of the small fibers that are grown together, so to speak, in the plant but are gradually separated into smaller groups by the various chemical and mechanical processes on the way between the plant and the finished cloth.

Cotton as it is picked is relatively clean and pure; wool is dirty enough, but can be cleaned by a simple scouring process. Flax, however, comes mixed with several times its weight of rubbish and must be subjected to tedious hand work and complicated machinery to free it from the rest of the plant. In fact, every fiber through every bit of its length is stuck to something else, either other fibers or the stem, if not both.

After knocking off the seed, the first refining process is retting, or rotting as it is often called by old flax men. Between retting and rotting the difference is sometimes hard to see, as attested by the odors that

assail one for miles along the Belgian River Lys, the greatest rettery in the world, so perhaps one designation is as good as the other. Retting is a bichemical group of reactions, usually brought about by bacteria that occur naturally in the plant itself. There are different ways of obtaining the result, although the end sought is the same—the loosening of the pectin binding material that is found between the fibers and stem, so that the latter can be broken without causing excessive waste of fiber. The simplest retting process is spreading the flax straw out on the fields exposed to the dew and rains. This exposure to moisture and to the atmosphere by frequent turning of the straw promotes the desired fermentation. Other retting methods involve the immersion of bundles of flax in slow flowing rivers, in pools of water or in suitable tanks. These methods give a more rapid retting and are more dependable. The tanks are usually heated to still further accelerate the process. The photo shows the River Lys lined along both banks with floating "balloons" of retting flax. The field is covered with flax already retted, set up in "wigwams" to dry. With the many great stacks of flax bundles, this scene is typical of the Belgian industry as it is followed for miles along the river.

Science and the Art of Retting

Retting, like all fermentations, is subject to difficulties, like the invasion of undesirable bacteria or the process going too far. Attempts have been made to propagate the necessary bacteria in the form of pure cultures, and thus obtain quicker and more uniform results. A year ago only one or two such plants were in actual operation, so it appears that retting has not yet been greatly aided by science. The illustration shows a plant in southern France employing the Rossi "cultivated" bacteria.

Retting has loosened the fiber from the stems, but not in such form that they can be readily separated. To effect this the dried stems are first broken through corrugated rollers to reduce them to small bits; then scutched or beaten with revolving blades to knock out the pieces, which have now become "shives," and the short loose fibers; and finally heckled or combed to split the fiber groups into still finer ones and remove any remaining shives and loose short fibers. The result of all these operations is *line*, the valuable flax consisting of nicely paralleled fibers ready for fine linen, and tow, which we can almost call a by-product, which is made into yarn for coarser cloths.

So far the operations are all difficult and expensive; the latter because they involve a great amount of hand work and an enormous shrinkage or loss of material. Some German authority has calculated that one acre of flax will yield 322 men's shirts, the product from over a ton and a half of straw, or not far from 5 per cent.

The succeeding operations of yarn and cloth manufacture are in general like other spinning, weaving and finishing, although, of course, differing much in detail.

American Flax for Seed

As we have once hinted, the industry of the linen plant is not confined by any means to fine linens, for there are raised in the United States about two millions acres of flax every year, yielding a third of a ton of straw per acre and seven bushels of seed. The seed goes to market and is distributed to the ends of the earth, but the flax straw remains for the most part right on the farm. It has no appreciable value to the farmer. It cannot be fed out, as the stringy fiber would form balls of tow in the cattle's stomachs. Therefore, great stacks of it are still burned every year. The more accessible portion of the straw is collected and used for upholstering tow, insulating board and rug manufacture, the latter being the only appreciable textile use of this flax by-product.

This great amount of flax straw scattered widely over several of our largest though more thinly populated States, as well as over western Canada, has been one of the outstanding national wastes that should be better utilized. It has, however, already ranked close to oil as a field of exploitation to attract the dollars of the unwary. A sad part of it is that so many of the failures have followed honest attempts to make some valuable and useful material from this seed flax straw.

Beautiful samples of the fiber and yarns can be prepared and attractive figures galore, but economics seem to be against most flax schemes.

In the first place, the flax is raised with no idea at all of using it for fiber. True, fiber flax is sown quickly so that it may grow tall and straight, and is kept free from weeds. Finally, it is harvested in small bundles by hand pulling, so as to keep the stem (and fibers) as nearly parallel as possible. Seed flax, on the other hand, is sown thinner to make branching stalks with

Flax in Belgium, River Lys

more heads to bear seeds, so it starts out without a fair chance to yield the best of fiber. If the ground is full of weeds so is the flax, for there is no way to care for it on the hundred or thousand acre scale. The farmer is after seed, so he allows it to mature on the stalk beyond the most favorable point for good fiber. When ripe, the flax has to be harvested in the least expensive way possible, which means regulation reaping and threshing. The stems are usually short at best; and a third, the lower part with the best fiber, is left in the ground. The rest goes through the thresher and lands in a thoroughly broken and tangled heap, chaff, weeds and all.

The flax could hardly be in a worse way for textile uses if everybody actually conspired against it.

A Future Two-Purpose Crop

Flax rightly should be a two-purpose crop, and it seems possible to make it so. However, before anything approaching fine clean yarn can be made on a practical cost basis it will be necessary to handle the crop in a different way, to favor the fiber as well as the seed. This means new and different machinery and the education of a large group of our agricultural population into some different way of doing things, all formidable tasks beyond the resources of any ordinary corporation.

The fiber from seed flax is the same as that from fiber flax, for the plants are the same aside from differences in their habit of growth. It will naturally be somewhat coarser and may be inferior in strength, a property which depends very much upon the climate and local weather conditions. The raw material, however, exists for some great new linen industry, but still we must say, "Beware the flax promoter with his beautiful white samples and attractive figures."

Cottonizing of Flax Waste

Men have struggled ever since the use of textile machinery, by all the devices of their arts, to linenize cotton, for about the same reasons that other men have promoted the sale of gilded bricks. Now we are confronted by the strange spectacle, especially in central Europe, of the chemists and textile engineers trying to *cottonize* linen. They, however, have better reasons, and in visiting a German plant it was found that flax card waste, usually of slight value, was being combined with cotton and manufactured into very good fabrics. The process was confidential, but the flax at the various stages of the cottonizing process looked very much like products obtained during the making of paper stock from coarse flax tow. This suggests that vigorous treatment to chemically remove the woody matter is required, and that the work is accompanied by tremendous further shrinkage. The process is nothing more or less than the breaking down of the natural fiber bundles of flax to more nearly their single individual fibers, by chemical and mechanical means, until they resemble cotton both in appearance and in spinning properties

Rossi Flax Rettery in Southern France

While this cottonizing idea has appeared in the literature for some years, the work seems to have been greatly accelerated by the war, when cotton was such a dire necessity in Germany. We suspect that part of the activity now is promoted by a desire for greater independence from outside fiber sources.

One American firm has put on the market a towel which contains fibers that are virtually cottonized flax, although no advertising man would call them by that name. Without any reference to the merits or economics of any particular product, it seems that such a process would have more value across the water than here; for, relatively speaking, flax is cheap and cotton expensive, while here cotton is cheap and flax expensive. However, we may some time find it of advantage to make poor flax spin like cotton, as well as to try to make cotton look like the finest flax product—linen.

War Effects on Linen

The war did many things to the linen industry and, as a result of these and of the world-wide depression, linen has been slow to recover. The German industry was stimulated because textile fibers were scarce, Belgian work was hindered by the occupation, Lille, the French linen metropolis, was the center of intense war activity and destruction. Plants were destroyed, women workers taken away from the district and the men either in service or on the casualty list. The writer saw French machinery that had been carried off now restored and running, but there were still gaps on the floor for spinning frames not yet recovered. The greatest flax industry in the world, the Russian, was practically destroyed. In England, demand for linen for airplane fabrics and other uses, coupled with the dearth of foreign supplies, led to expansion which even extended a flax boom into Canada. The sudden stopping of the abnormal demand and the general impoverishment of the people caused a great slump after

the armistice. Now, during a tendency to recover, the cheap Russian supply is lacking and economic conditions are such that flax costs too much. Other explanations may be made, but this seems to be the real trouble, as nearly all efforts at flax development are, consciously or unconsciously, in the direction of reducing flax production costs. As an industry, relief may be found in allowing cotton to take the place of the cheaper fabrics and concentrating attention on the very fine expensive articles, but this does not seem to be a real remedy. On the Continent, for instance, flax is in daily use for many ordinary fabrics, and a greater supply instead of less is needed.

Pre-war prices were very largely set by serf conditions of labor in Russia, and the whole great industry was very largely based on these values. The return of such conditions is uncertain and hardly to be expected, so a new foundation is necessary. The only dependable thing that can put flax again on anything like the same cost basis is large-scale production by machine methods.

In the past, the linen industry has been driven under compulsion, aided by bounties and taxed by law, and in spite of its recent difficulties it will probably emerge with its production costs reduced to a practical and permanent basis. The amount of research and inventive activity now going on is astonishing and seems bound to bring slow but substantial results.

About a year ago the writer outlined in The REPORTER the German provisions for research on flax. There is now also well under operation a British Linen Industry Research Association, with headquarters in Ireland, studying flax problems from seed to cloth. In addition to this systematic study, there are many independent inventors at work. Flax pullers that shall painlessly extract the plants from the ground to preserve their full length as well as spinning quality have occupied inventors for years. There are American, Canadian, English and Continental machines, and they are now somewhat successful although still considered experiments.

There are new deseeders, breaks and scutchers to handle both tow and line flax.

Retting has had almost more than its share of attention. Modified and improved natural processes are now in very large scale operation, with further improvements constantly being sought. Many so-called chemical processes have been patented, but with scant success. It is doubtful if any of them are in use, with one exception, the Peufaillit, which is working in a plant in northern France. A combination of kerosene and soap with hot water in a kier-like autoclave is turning out very satisfactory flax in a few hours as compared to several days by the shortest bacterial method.

In processes beyond scutching, the manufacture of flax is already on a rather satisfactory mechanical basis. Getting the flax cheaply and freeing it from the woody stem are the real problems.

Flax has always been a favored crop, not only for the fibers but for the taxes that it has been made to yield. It has reflected the customs of all periods of history. The love of fine linen is almost hereditary, and it has so long been woman's favorite fabric that we cannot believe that the industry will permanently languish.

The Spectroscope and Spectrophotometer and Their Application to the Identification and Analysis of Dyes

Nature of Light—The Spectrum—Construction of the Spectroscope—Production of a Line Spectrum—Absorption of Light—Use of the Spectroscope—Proper Dye Solution—Sensitivity of the Eye—The Spectrophotometer

By H. WALES

Associate Chemist, Color Laboratory, Bureau of Chemistry

At the present time much attention is being given to the use of the spectroscope as a means of identifying dyes. When a person desires to undertake work of this sort he finds himself handicapped at the very outset because of the meager and scattered information regarding the adaptation of this instrument to dye testing. In order to understand the function of the spectroscope it will first be necessary to consider some aspects of the nature of light.

Light as we ordinarily see it, as from the sun or an incandescent lamp, is spoken of as white light. This light is regarded as having no color, but as a matter of fact it is really composed of an infinite variety of colors. Just as the sensation of sound is produced by the effect of a certain type of vibration on our ears, so is color produced by the sensation of another type of vibration on the eye. There is, however, this difference; although the ear can detect and separate two distinct sound vibra-

tions reaching it at the same time, the eye is unable to separate light vibrations and the color which we see is the resultant sensation produced by a number of light rays of different colors. When a beam of light is passed through a transparent prism—usually a wedge-shaped piece of glass—the path of the ray is bent from its original direction and is said to be refracted. It has been found that the amount of refraction will depend on the vibration frequency—vibrations per second—of the ray of light. Thus when a narrow beam of white light is passed through a prism it is broken up into a widened-out band showing a range of colors corresponding to the different vibrations, with the red at one end and the violet at the other. This is what is known as a spectrum.

For convenience light is usually measured by the length of the wave rather than by the vibration frequency. These wave lengths are represented in two ways: either as millimicrons, which are the millionth part of a millimeter, or as Angstrom units, which are one-tenth the value of the millimicrons.

The human eye is sensitive to only a small portion of the spectrum of sun light. Below the red there is a region known as the infra-red, and beyond the violet another vast region known as the ultra-violet. The visual spectrum is commonly divided into the six familiar colors

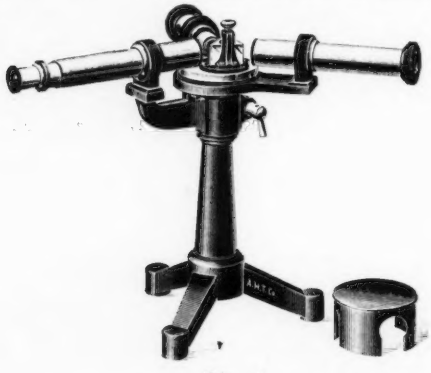


Fig. 1

of the rainbow. These colors occupy the following regions in the spectrum:

Red	7000 — 6500	AU
Orange	6500 — 6000	"
Yellow	6000 — 5500	"
Green	5500 — 5000	"
Blue	5000 — 4500	"
Violet	4500 — 4000	"

These boundaries are merely approximations, as no one can determine exactly where one color ends and the next begins.

We cannot speak of red, green or blue as definite things. The region covered by the green varies from a very yellow green to a greenish blue. Neither can we set definite limits for the visual spectrum. The distance to which one can see into the red or violet varies and depends entirely upon the sensitivity of the eye of the individual.

In order that the different parts of the spectrum shall be clear and distinct, it has been found necessary that only a thin slice of light fall on the prism. To accomplish this a tube is placed in front of the prism with a slit at one end to give a narrow beam, and with a lens at the end towards the prism to focus the light. This tube is known as a collimator. In order to enlarge the spectrum formed by such an apparatus a telescope is placed at the side of the prism from which the light

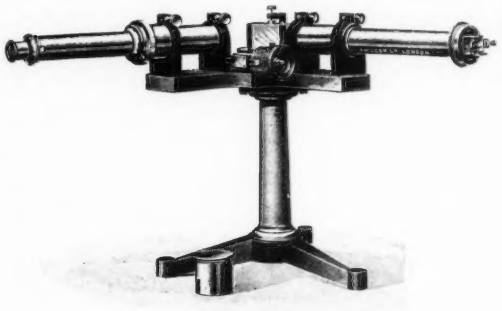


Fig. 1*a*

emerges. This combination of collimator, prism and telescope, or as it is sometimes called, observing tube, is known as a spectroscope. When a spectroscope is equipped with a scale or other device for measuring the wave length, it is sometimes called a spectrometer. This is an exceedingly valuable scientific instrument for making many observations in chemistry, physics, and astronomy. All of the more recently discovered elements have been found by means of the spectroscope, and this instrument furnishes the only known means for determining the constitution of the stars. Several types of spectroscopes are shown in Figs. 1, 1a, and 1b.

When a little piece of sodium chloride is held in a non-luminous flame, such as that from a Bunsen burner,

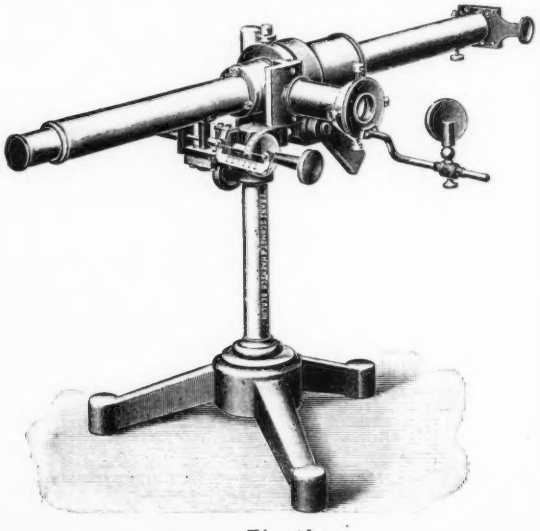


Fig. 1*b*

which is placed before the slit of a spectroscope, two yellow lines very close together can be seen by looking through the telescope. This is known as a line spectrum. Similar lines in different parts of the spectrum are produced by the luminous vapors of all the elements. The positions and number of the lines will depend on the particular element used, in some cases several hundred lines being formed. By noting the positions of these lines very minute traces of an element can be detected.

If now, sodium vapors are placed between the white light source and the slit of the spectroscope, two black lines will be seen at the same point in the spectrum as the bright lines mentioned above. In this case the light of the same wave length as that emitted by the luminous flame has been absorbed by the sodium vapor. If the spectrum of sunlight is examined, using a very narrow slit, many of these dark lines can be seen. These are known as the Fraunhofer lines, and are due to the elements in the gases surrounding the sun. We can see, therefore, that there are two types of emission spectra; that known as the line spectrum, which is composed of bright lines of different colors, and the continuous spectrum which is given by the light from an incandescent solid.

If we take a piece of colored glass or a test tube containing a colored solution, and place it between the source of white light and the slit of the spectroscope, we find that we no longer have a continuous band of colors, but that there is a gap in some portion of the spectrum. This colored substance has absorbed a part of the light and produced what is known as an absorption band in the spectrum. The position of this band will depend largely on the color of the dye which has been used in the solution.

In general, it has been found that yellows transmit all the spectral colors except the violet; blues absorb varying amounts of red and yellow; greens absorb both the red and the violet; and reds absorb in the blue or the green. Between these there are an infinite variety of shades showing one or more absorption bands in different parts of the spectrum. The difference in tone between two dyes of similar color, such as two yellows, will depend on how far up into the violet transmission occurs. It can be seen from this that objects are not colored because they transmit light of only one color. Such a condition is rarely met with in practice. It is known as monochromatic transmission, and the nearest approach to it in the case of dyes is shown by very concentrated solutions of same colors which absorb all except a narrow spectral band.

Most colored objects are not transparent and are viewed by reflected light. The color is due to the fact that some of the light penetrates their surfaces slightly before being reflected and emerges robbed of the rays which are the most strongly absorbed.

This method of producing color by the absorption of certain of the visual rays from the total spectrum is known as the subtractive method and is the usual cause for color. The opposite condition to this gives rise to the additive method. If beams of yellow and blue lights are superimposed on a screen the resulting light will be white. In this case all the visual rays except the blue are transmitted by the yellow, and its addition produces white. Two such colors which, when mixed form white, are known as complementaries. In the subtractive method the resultant from a mixture of these colors is green, as the rays of the green portion of the spectrum are the only ones transmitted by both the yellow and the blue (Fig. 2).

This phenomenon of selective absorption of light by colored substances renders the spectroscope a very valuable instrument for the identification of dyes. As far as it is known at the present time no two dyes show exactly the same absorption. By determining the position of the absorption band, or preferably the point of maximum absorption, most of the dyes can be easily identified. In cases where two or more dyes show bands so similar as to make this difficult, a slight change in conditions, which will be described later, will serve to distinguish between them.

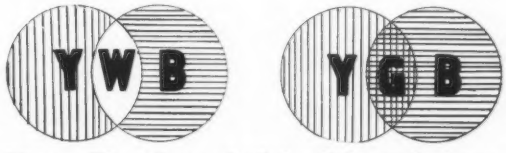


Fig. 2—The effects of mixing lights and pigments

In order to make measurements with the spectroscope it is necessary to have some method of determining the position of the bands. This is accomplished in different instruments in several ways. In some cases an illuminated scale is reflected from one face of the prism into the telescope in such a way that it is superimposed on the spectrum. In others the eyepiece of the telescope is equipped with cross hairs or a pointer, and either the telescope or the prism is moved over a graduated scale or by means of a drum until the part of the spectrum to be measured coincides with the cress hairs or pointer. This scale or drum may be calibrated to read wave lengths of light directly, but in most cases it is divided into purely arbitrary divisions. In such a case the scale must be calibrated before the spectroscope can be used. To do this we must measure the positions of a number of lines in different parts of the spectrum and plot a curve showing the scale or drum readings and the corresponding wave lengths. From this curve we can then determine the wave length for any setting of the drum or division of the illuminated scale.

The sodium flame is usually used to determine one point of the spectrum and will serve as an example of the method of calibration. The spectroscope should be pointed directly at the flame and the slit narrowed until the two sodium lines which are known as the D lines and have wave lengths of 5890 and 5896 Angstrom units are separated. Some spectroscopes do not have sufficient resolving power to separate these lines. In such a case the mean wave length of 5893 should be assumed. If these lines are not sharp and clear the telescope is

out of focus and should be adjusted. If the instrument is equipped with an illuminated scale the positions of these lines on the scale should be recorded. In the other types the drum should be slowly rotated until the cross hairs coincide with first one line and then with the other, and the drum settings recorded. It is advisable to always rotate the drum in the same direction when making a reading in order to eliminate any possible error due to back lash. After determining the positions of the yellow sodium lines other lines in the red, green, blue, etc., must be measured. The lines for all of the elements have been carefully measured and may be found in nearly all handbooks of chemistry and physics. Such sources of line spectra as the potassium, lithium, magnesium and strontium flames and the mercury arc are suitable to calibrate the visual spectrum. A calibration curve determined in this way for a spectroscope having an illuminated scale is shown in Fig. 3. If the instrument is graduated to read wave lengths directly, it is necessary to check some reading. To do this some line is chosen and the drum set to give the correct wave length for this line. The cross hairs or pointer is then moved until it coincides with the line. The collimator should now be pointed toward a bright light, such as an incandescent lamp or a carbon arc, and the slit opened until the spectrum appears bright and clear and free from longitudinal lines.

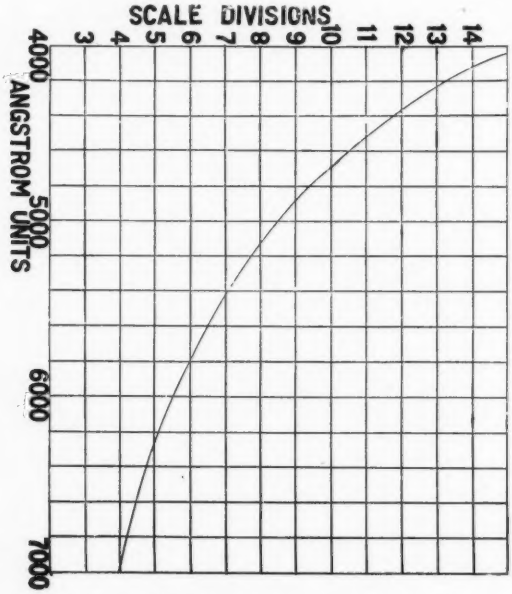


Fig. 3—Calibration curve for spectroscope

The machine is ready for use and a solution of the dye is placed before the slit. If the solution is too concentrated it should be diluted gradually until the absorption band, or bands if there are more than one, stand out clearly. In a concentrated solution usually only one band is seen which often covers nearly the entire spectrum. As the solution is slowly diluted the width of the band steadily decreases and becomes one or more relatively narrow bands.

When a solution contains more than one band they usually flow together on concentration into one broad band, and under such conditions the spectrum has no significance because no conclusions can be drawn in regard to the form or location of the band. In order to obtain a true picture of the spectrum of the dye under investigation, the solution must be diluted gradually until the band or bands stand out sharply and begin to fade if diluted further. If the solution contains more than one band the weaker may entirely disappear at the dilution required to bring out the principal band. The solution must therefore be brought to the proper dilution to bring out the weaker bands, and after their shape and location has been recorded more solvent added until the strongest or chief band can be measured. It is necessary to proceed very slowly with the dilution, otherwise the fainter bands may disappear too rapidly and be overlooked. It should be remembered that a concentrated solution inspectro-analysis is in reality a very dilute solution. In most cases a concentration of 1 part or less in 10,000 is sufficient for work of this kind.

After the proper dilution has been obtained; that is the dilution at which the band is as narrow as possible and just before it begins to fade at the edges, the location of the darkest point or absorption maximum must be measured. This is done by moving the telescope until the middle of the cross hairs lies on the darkest point of the band and reading the wave length from the scale or drum. The absorption maximum usually does not lie at the center of the band, so the form must be recorded. An absorption spectrum does not consist of sharp black bands across the spectra. The light is gradually diminished up to a certain point in the spectrum and then increases again. By locating the point of greatest darkness and the edges of the band, a picture of the absorption can be drawn.

Since the breadth of the band depends to a great extent on the concentration and the thickness of the layer of the solution, the shape of the curve may be established by measuring the edges of the bands for a series of concentrations or series of layers of different thickness and representing graphically the results thus obtained.

The absorption bands of a very large number of dyes dissolved in various solvents have been mapped using the simple spectroscope by Formanek and Grandmougin (Fig. 4), and their published data comprise probably the most complete lists of absorption spectra available.*

Unfortunately, a large personal error enters into results obtained by these methods. This is due to the varying sensitivity of the human eye toward light of different wave lengths. However, the cost of the more accurate spectrophotometers is in many cases prohibitive, and the analyst must make use of the less expensive spectroscope. This instrument will prove sufficiently good for most work.

The average eye is most sensitive toward light of a

*"Untersuchung und Nachweis organisher Farbstoffe auf skeptroskopishem Wege," published in 1911 and 1913.

yellow-green color, as can be seen from Fig. 5, but it varies throughout the entire spectrum for different individuals. This can easly be demonstrated by recording the line spectrum for some element, when it will be noticed that some observers will be able to see lines farther into the red or violet regions. If the perception of certain wave lengths is abnormally undeveloped we find the phenomenon known as color blindness. One of the most common examples of this is the inability to distinguish between red and green. Both of these colors, as usually met with, contain considerable yellow, which to the color-blind becomes the predominant hue. Since the average eye becomes more sensitive as the yellow or yellow-green region is approached, it can readily be seen that there would be an apparent displacement of the absorption band away from this region; and since there is such a great variation in the eyes of different individuals, two observers will probably obtain slightly different positions for the absorption band of the same dye.

These personal factors are obviated by using the more accurate spectrophotometer. A photometer is an instrument for comparing two beams of light of different intensities, and the spectrophotometer, as its name indicates, is an instrument for comparing two beams of light at any point in the spectrum. In principle it consists of two spectroscopes arranged so that the intensity of rays of the same wave length in the two spectra can be compared and measures the actual amount of light absorbed by the dye. In this case no errors are introduced, due to the sensitivity of the eye toward different parts of the spectrum. Only a very narrow beam is viewed at one time, and the accuracy of the results is determined only by the skill of the observer in comparing the intensities of two beams of light of the same color. A further advantage of the spectrophotometric method is that the amount of absorption at any point in the spectrum may be taken as a measure of the purity of the sample.

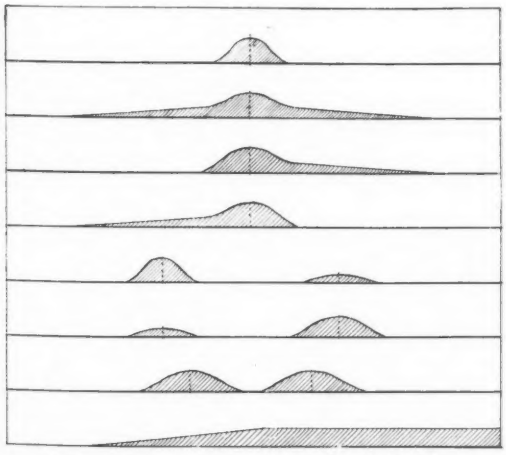


Fig. 4—Absorption curve as determined by the spectroscope (Formanek)

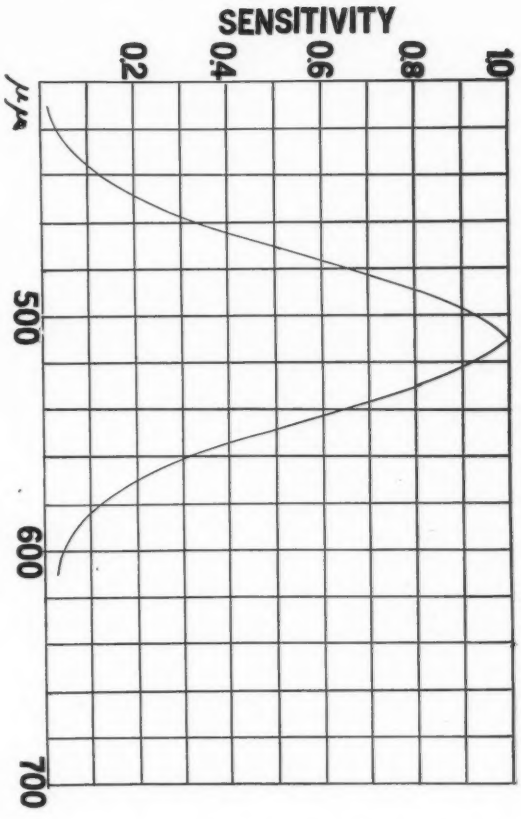


Fig. 5—Sensitivity of the human eye

When a ray of light passes through an absorbing medium, a part is absorbed and the remainder transmitted. The function of the photometer is to measure this fraction of light which is absorbed. It accomplishes this by comparing the intensity of the beam which has passed through the solution with the intensity of the original beam. The negative logarithm of the ratio of the intensity of the transmitted light to the original light is known as the extinction coefficient and is expressed as

$$E = -\log \frac{It}{Io}$$

Although some investigators record their absorption spectra in terms of the percentage of light transmitted, the majority use the extinction coefficient, since this has a quantitative value increasing directly with an increase in concentration or increase in the thickness of the layer of the solution, both of which have the same effect in decreasing the amount of light transmitted.

Before proceeding to a discussion of the methods of using the spectrophotometer it will be necessary to consider some of the types of apparatus in use.

(End of Part I—Part II will follow in a future issue)

Things Every Textile Chemist and Colorist Should Know

No. 9

Methods of Analysis of Union Textile Materials, Particularly Mixtures of Cotton and Wool, and Allied Fibers

THE chemical analysis of a union textile material involves tests for both the amounts of fiber substances present and the quantities of certain non-fiber matter which accompany them.

Of first interest among the non-fiber substances is "moisture." Moisture is a natural component of fibers, and a standard, normal quantity of it is allowed as "regain" for the moisture-free fibers, but the amount of moisture present in the fabric is very variable with changes in the humidity and circulation of the surrounding air. Therefore, in order to eliminate errors in the expression of the results of the analysis, and to make these results more comparable from time to time, it is very desirable to find out the quantity of moisture in the air-dried fabric at the time of weighing the sample for analysis. Moisture is determined as the "loss on drying" experienced by a weighed sample when heated in the circulating air of a hot air oven, at a temperature of 105 to 110 deg. Cent. (220 to 230 deg. Fahr.). The test gives figures for "moisture" and for the "bone-dry" or moisture-free residue of the fabric.

Usually, in a normal cotton-wool union, this bone-dry residue is taken to represent the amount of dry fiber in the sample, the content of other foreign substances—oil, fat or wax, or starch, gum dyestuff, filling material, etc.—being considered negligible. If greater accuracy is required, these foreign materials are tested for, thus giving more truly the amount of pure fiber substance in the goods.

In the chemical examination of the fiber portion of the fabric, to determine the relative amounts of cotton and of wool, or allied fibers present, there are two general methods available. One method depends upon the destruction of the vegetable matter through carbonization with sulphuric acid or water solution of aluminum chloride. The other method eliminates the wool by dissolving it in a boiling solution of caustic soda or caustic potash.

The carbonization process is probably limited in its use as an analytical procedure. It has special advantages for use where it is desired to work further with the wool after the separation of the cotton, or for use in cases of certain artificial silk mixtures with wool where these silks have a considerable and undeterminable solubility in the caustic alkali.

The process is carried out by saturating a weighed sample in a slightly warm solution of sulphuric acid (5 to 7 deg. Baume strength), squeezing out the excess acid, and carefully drying the treated goods in an oven at 180 deg. Fahr., gradually increasing the temperature to 212 deg. Fahr., and finally baking for 15 minutes at 220 to 230 deg. Fahr. The baking has the effect of chemically dehydrating the vegetable fiber, rendering it very brittle. The carbonized matter is then removed by vigorous, dry-rubbing on the hands. The acid is washed out in water and the last traces neutralized with dilute ammonia. If necessary to complete the removal of the final amounts of carbonized material the sample may be well rubbed in strong neutral soap suds. After final removal of acid or soap, the wool residue is dried to a constant weight in a hot air oven, cooled in a dry atmosphere and weighed out of contact with moisture There is thus obtained the bone-dry weight of wool which was in the sample.

The alkali process for the removal of the wool in a sample of union goods possesses the advantages of rapidity, ease of carrying out, and thoroughness in separation of the wool. It can be applied with equal facility to any per cent of wool-cotton mixture, and because of these facts is the method more generally employed.

To carry out the test using caustic soda, a weighed sample is entered into the boiling solution which has a strength of 10 to 15 per cent caustic soda. The volume of the solution is of little importance as long as enough liquor is present to permit the cotton residue to be well agitated and stirred beneath the surface. The sample is boiled for 15 minutes, with frequent stirring and then the cotton residue transferred into boiling, plain water for washing. The liquor of the first solution is carefully filtered, either through a gooch crucible (if the total amount of cotton is small), or through a 100 mesh, all metal sieve, which is inclined at an angle of about 45 degrees to the horizontal. By pouring the solution into the lower edge of the inclined screen, the loose fibers and thread ends will be recovered very quickly. They may then be rolled into a ball with the finger or washed into the second bath with the major portion of the cotton, by means of a stream of water from a wash bottle. This careful recovery of all loose fibers must be carried out with every subsequent solution or wash water employed.

(*Continued on page 773*)

Notes on Handling Dyes in Paper Mills*

By Louis J. Matos, Ph.D.

THE volume of water necessary to dissolve and hold in complete solution a certain weight of dye depends upon three important factors, viz.: the coefficient of solubility of the dye, the temperature of the water, and time.

In ordinary industrial operations where a number of difficult dyes are necessarily used, each in its own water solution, it is usual for the workman to draw such a volume of water as experience tells him will dissolve the least soluble of the dyes he has to do with, thereby feeling sure that that volume, or a proportionate amount, will dissolve any other dye he may have to deal with.

In paper staining—and this term is applied here to mean imparting color to paper in any stage of its manufacture from pulp in the beater to finished sheets—it is absolutely necessary that when dyes are used they must be completely dissolved in warm or hot water, and then, to insure against the possibility of any hard particles or specks of dye that may resist dissolving at the temperature of the solution, it is strained either through a fine haircloth sieve or through several thicknesses of cotton cloth.

It is necessary to note that time is an important factor in bringing dyes into solution. All dyes do not dissolve at the same rate at one temperature, therefore in making solutions of dyes due regard must be paid to each of the conditions above referred to. As a matter of safety it should be made a principle always to dissolve each color separately instead of dissolving two or three colors in one amount of water, even though these colors should belong to the same group of dyes.

Referring again to the volume of water necessary to dissolve completely a unit weight of dye, the least quantity of water at a given temperature that will do the work is the volume that will produce a saturated solution. Such a solution is one that is incapable of taking up any additional quantity of dye, but which will deposit some dye if the temperature is even slightly lowered.

It will therefore be apparent that for positive safety the volume of water that should be used in dissolving dyes for stock color solutions should be at least several times the actual volume necessary to produce a saturated solution. For ordinary acid and direct dyes, the least amount of water to be used should be about 5 gallons for each 1 pound of dry dye, or in the general proportion by weight of 40 pounds of water to 1 pound of dye. It is to be remembered that a few dyes of each of the above groups possess the property of separating from their solutions on cooling, a condition that suggests the immediate use of the dye solution in the beater.

Avoiding specks of undissolved dye particles has been referred to. One way to prevent this unpleasant feature is to use dye dissolving tanks exclusively for one class of dyes, and not to dissolve basic dyes in tanks in which acid dyes were previously dissolved. Many basic dyes combine instantly with acid dyes forming difficultly soluble compounds which, if not strained out, will pass through the beater and into the paper, showing up distinctly as specks and also in the form of shaded areas of varying sizes. Color solution tanks should therefore be thoroughly cleaned by boiling out several times with clean water, and perhaps with the addition of a small amount of soda ash to facilitate the removal of the last traces of dye.

Reference to the formation of difficultly soluble compounds resulting from the combination of basic and acid dyes gives importance to the order in which dyes of these two classes should be added to the beater. If a shade requires both dyes to be used, it is best to run the solution of acid dye in first, and in a reasonable time afterward run in the basic dye solution. The chief point to observe is that any precipitation of color (i. e., the formation of the difficultly soluble new colored compound) taking place should be in the pulp fiber, and not in the water.

Regarding the proper temperature for dissolving dry dyes for paper staining, both direct and acid dyes in neutral solution may be actually boiled, but boiling is not essential for complete solution. On the other hand, basic dyes should not be heated above 170 or 180 deg. Fahr., since all basic dyes show signs of decomposition as the temperature increases. Some few basic dyes should not be heated in excess of 160 deg. Fahr., which temperature the paper stainer should regard as being safe. Basic dyes are preferably dissolved with the acid of acetic acid, while both the direct and acid dyes do not require any acid, although in some paper mills it is the custom of the color man to use it.

The foregoing notes and observations do not attempt to cover completely the points discussed, but will probably serve as a guide, either in making experiments or actual beater-room trials.

*Copyright, 1923, by National Aniline & Chemical Company, Inc.

Italian Dyestuff Market

Genoa, September 28, 1923.
Special to The REPORTER.

IN the past five weeks the Italian lira gained nothing, the value of the United States dollar remaining always between 23.25 and 23.75 lire, and the value of the English pound sterling between 106 and 107 lire. The reason of this was the high purchases of corn in the United States and of coal in England, especially on account of the State railways, that could receive but little of this valuable fuel from Germany on account of war reparation. Industry, working in many cases at reduced hours, and often in the absence of the owners and directors, owing to the period of the holidays, used little coal. For a full week the Italian exchanges were closed, and this brought to a certain speculation in the value of foreign currencies, that did not, however, take the extension that might have been anticipated.

Dividends of Italian Dyestuff Works

During the past few years, because of unusual conditions of the Italian market, the precautions adopted, and competence of the technical and commercial staff, some of the Italian aniline color works could make an encouraging profit. Thus the Unione Produttori Consumatori Materie Coloranti of Milan, from a social capital of 2,000,000 lire, could make during its last financial year a net profit of 186,734 lire, to which could be added the residual profit of 3,309 lire, of the preceding financial year. The Fabbrica Lombarda Colori Anilina of Milan, from a social capital of 1,250,000 lire, could make a net profit of 88,747 lire.

Foreign Capital Investments

Encouraged by the new dispositions, specially arranged by the Italian Government, and others still being considered and of certain introduction later, important American financiering companies are showing more and more attention to industrial developments in Italy, and are essaying to place large sums of money in the same. Thus the Mantell Investment Company of New York has sent to the various corporations and firms in Italy circulars offering large loans for giving a stronger development to all civil services and other social exigencies in Italy. The loans proposed will be for a period ranging from five to fifty years and will be arranged on hypothecary guarantees, that can also consist of the revenues of the different municipalities. On these loans the debtors are demanded to pay an interest of 6 per cent. The loans will be made in dollars, and their reimbursement can be conducted in dollars, or in Italian lire, calculating a fixed exchange of 19.50 lire to the dollar.

An important American financier, Mr. Otto H. Kahn, one of the richest bankers of New York, has started on a tour throughout Italy to study the situation there, and to consider the possibility of investing an amount of American capital in its industries. He has a friendly feeling for Italy. After a permanence of several days in Rome, where he will meet the leading personalties, this gentleman will leave for the north of Italy to visit some of the largest works and industries there.

Besides the above, Spanish financiers have invested money in an underground railway to be constructed in the town of Genoa, and financing firms and financiers of other countries are also considering similar plans. German capital has already found a very fair employment in different parts of Italy, where it predominates in various branches of industry. For the above reasons Italy has become one of the most important fields of exploitation in Europe.

Italian Limited Companies

During the month of July the new limited companies constituted represented a complexive capital of 147,741,000 lire, and the increases of capital in the old companies reached 183,364,180 lire. The liquidations during this same month only reached 51,747,200 lire, the fusions 400,000 lire, and the reductions of capital 31,817,320 lire.

Demand for Coloring Matters

The demand for coloring matters improved slightly during the past five weeks, and centered as usual upon war reparation products and on coloring matters imported through private commerce from Germany, Switzerland, France, the United States and England. Among the colors sold were naphthylamine blacks, acid blacks, acid blues, acid greens, tartrazine, the ponceaux, water blues, acid navy blues, fast milling reds, alizarine blues, alizarine yellows, amido naphthol black, the rhodamines, the eosines, the safranines, fast cotton scarlets, Congo red, diamine cathechine, methyl violet, brilliant green, acid magenta, direct orange brown, diazo black BH, chloramine yellows, chloramine oranges, cotton sky blues, primuline, direct Bordeaux, direct violet, etc.

Prices of Coal Tar Colors and Dyehouse Products

No change was noted in the price of the war reparation dyestuffs offered to the different dyeworks, especially as these are still taken from the large stocks at disposal. The lots of colors offered by private firms suffered little change, owing also to the low demand. With the dyehouse assistants a certain change took place through the necessity of importing a number of colors. Thus refined glycerine was brought from 7,800 lire per ton to 8,500 lire, lactic acid was reduced from 6,000 lire to 3,000 lire, yellow dextrine from 3,400 lire to 3,250 lire, and white dextrine from 3,400 lire to 3,250 lire. Most other products remained, however, unchanged in price.

New Source of Industrial Alcohol

THE following letter was widely distributed by U. S. Senator E. S. Broussard of Louisiana. It briefly treats of a means whereby farmers in this country can transform surplus and waste farm products into a source of profit by distilling from such material industrial alcohol. The letter further recommends the repeal of Chapter III of the Volstead Act which at present prohibits the establishment of such an important industry.

UNITED STATES SENATE
WASHINGTON, D. C.

The present desperate plight of the American farmer is, of course, attributable to several causes. But one factor in his distressful situation is so predominant, so prominent, that it is strange indeed, that it has not engrossed and focussed public attention. It

(*Continued on page 771*)

Proceedings of the American Association of Textile Chemists and Colorists

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FIRST FALL MEETING OF THE NEW YORK SECTION

The first fall meeting of the New York Section of the American Association of Textile Chemists and Colorists was held at Stewart's Restaurant, 30 Park Place, New York, on the evening of Friday, September 28.

The meeting proper was preceded by an informal dinner, forty-five members and guests being present. The minutes of the previous meeting were read and accepted, after which the Chairman, Dr. Killheffer, announced the appointment of the following standing committees: Sectional Committee: Messrs. Flynn, Mitchell, Warner and Wood. Membership Committee: Daniel P. Knowland, Chairman, and Messrs. Bume, Clapham, Howes, Jones and Wilmot.

The committee in charge of the outing held in July reported a deficit and it was directed that those members who had signified their intention of being present but who had failed to appear be billed for the amount pledged on their account.

The Chairman then introduced in order the following speakers, who read papers as indicated: Prof. Elmer C. Bertolet, Philadelphia Textile School, "Textile Soaps"; J. F. Tonns, Oakley Chemical Company, "Some Practical Factors in the Use of Detergents"; John J. Sokolinski, Arabol Manufacturing Company, "Textile Mill Conundrums." F. H. Guernsey, of the Cowles Detergent Company, was unavoidably prevented from being present, but forwarded his manuscript, "Colloids in the Mechanism of Cleansing," which was read by the Secretary. All of these papers, together with the discussion which followed, are printed herewith.

HERBERT GRANDAGE, Secretary.

TEXTILE SOAPS*

By ELMER C. BERTOLET

Professor of Chemistry and Dyeing, Philadelphia Textile School

Soaps are chemical compounds prepared by treating an oil or fat with an alkali. Chemically, as you know, they consist of the alkali salts of certain fatty acids. The process by which they are made is known as saponification, a term which really means soap making, although it is a term generally used throughout organic chemistry.

The chief alkali employed is caustic soda, while caustic potash is used to a minor degree. The former yields soaps that are crystalline and hard, called hard soaps, while caustic potash gives soaps of a pasty nature that are not crystalline in structure and are called soft soaps. This term soft soap, however, must not be used to define a soda soap reduced down with water to a pasty mass.

The fats and oils which may be used in the making of soaps are numerous and varied. The soap maker

*A paper read before the New York Section of the American Association of Textile Chemists and Colorists

makes no distinction between a fat and an oil, calling all fatty material fats. The only real difference between a fat and an oil is one of melting point, the oils being liquid at ordinary temperatures and the fats solid or pasty.

The oils and fats of both animal and vegetable origin consist chemically of compounds of glycerine with various fatty acids. Glycerine is a tribasic alcohol and combines with three molecules of the fatty acid, forming a triglyceride, which is the condition of the fat in animal or seed. In the alkaline saponification of the oil or fat, hydrolysis takes place with the formation of soap, which is the alkali salt of the fatty acid, free glycerine being liberated. Glycerine, being soluble in water, is to be found in the waste lye and can be recovered.

The fatty acids that occur in greatest amount in the oils and fats used in soap making are palmitic, stearic and oleic acids. The glycerides or compounds of glycerine with these acids are known respectively as palmitin, stearin and olein. Nearly all the fats and oils contain, in the main, at least two of these three glycerides in varying proportions. It is this difference in the relative amounts of the three glycerides present that causes differences in the character of the fats and oils, and in turn differing properties in soap made therefrom.

Olein is liquid at ordinary temperatures; thus olive oil rich in olein is a liquid fat or oil at ordinary temperature. Stearin and palmitin are solids; thus tallow and palm oil, which are respectively rich in stearin and palmitin, are solid or pasty, the relative hardness of these oils one time from another being dependent on the relative proportion of olein and palmitin or stearin that they contain. Thus palm oil and tallow would have different melting points between certain limits, depending on the amount of stearin or palmitin and olein present.

The character of the fat used for soap making has a decided influence on the hardness of the soap and is an index as to the solubility of the soap in cold water. Soaps rich in olein do not harden as rapidly or as firmly as soaps rich in stearin. One other distinguishing point of vital importance is the question of relative solubility. Soaps rich in olein are quite soluble in cold water, while those rich in stearin or palmitin are practically insoluble in cold water, and set or gel when the solution is cooled. Green olive oil silk soap, which is rich in olein, and when of the proper specifications, should produce a 10 per cent solution in water without showing very much gel in the solution, whereas a 1 to 2 per cent solution of soap rich in stearin or palmitin will set to a stiff paste. It is this factor that decides largely the nature of a soap to be used for scouring. It can easily be seen that the soap rich in olein is a freely rinsing soap, being easily removed and at low temperatures, because of its great solubility and lower melting point, than a soap rich in stearin. In a great majority of cases, soaps rich in olein are therefore chosen for scouring rather than those rich in stearin. The olein containing soap, of which green olive oil silk soap is an excellent example, is a good and perhaps the best example of a scouring soap. When soaps rich in stearin or palmitin are used for scouring, higher temperatures must be maintained in the wash water, temperatures sufficiently high to melt the soap.

The writer has just had brought to his notice an example occurring in the industry illustrating in a peculiar way the trouble that might come from the improper handling of a soap in scouring. In a hosiery dyehouse connected with a plant where artificial silk-mercerized cotton stockings were made the dyer used a tallow soap for scouring out the added oils before dyeing. Between the scouring and dye bath a cold water wash was given, and then the goods were put in the dye bath. This cold water wash did not remove the tallow soap but, on the other hand, precipitated the soap in the goods, due to lack of solubility of this type of soap in cold water. When the dye bath was entered, the heat was sufficient to dissolve the soap, and this in turn combined with the hardness in the water to form lime soap, causing a troublesome scum in the dye bath with soap that should have been removed. Substitution of a soap rich in olein with the same method might have been successful in removing the trouble, but the difficulty could have been avoided by giving the hosiery a hot wash before the dye bath.

You will notice in this case that either soap could have been used, but a knowledge of the product must be at the command of the user. It also shows the advantage of using a soap of good solubility for scouring. Rinsing out thoroughly after scouring is essential.

In a process like tin-weighting of silk it is quite necessary that soap be completely removed after the degumming process and before entering the tin baths, else sticky, insoluble tin soaps would be formed which could easily cause uneven dyeing.

In the scouring of woolen pieces or materials of any nature it would defeat the purpose of scouring if soap were not thoroughly rinsed from the goods which were to be subsequently dyed in an acid bath. The acid decomposes the soap and causes the liberation of free fatty acid in the material, putting in the goods the very thing the scouring tries to remove and giving a prospect of uneven dyeing.

Here again the speaker is not saying that soaps rich in stearin are not and cannot be used for scouring. The point remains, however, that the condition of working must be changed when soaps of different character are used. This, from what has been stated, is obvious.

It is quite possible also to get different effects when soaps of different character are used in a comparative way. I am quite sure you will find a noticeable difference in wool raw stock scoured with olive oil soap as compared to palm oil or tallow soap, for example.

The question now comes up, What is the difference in soap? Isn't soap, soap? The answer is, apparently, yes.

2. Can't any soap be used for any purpose? On the face the answer is, apparently, yes.

3. If we had but one fat and one alkali with which to make soap would we be able to make it answer all purposes? Again we might say, of necessity, yes.

4. Why, then, do we make any distinction in composition in our choice of soap for a purpose?

Granted that any soap will do for any purpose if absolutely necessary, we must realize that one soap, because of different properties, is better suited than another for a certain purpose. Theoretically, while soap is soap, practically, we find the users of soap have a choice as to the product they wish to use for a purpose. Conditions under which soap is used have a great influence on this choice.

Textile soaps, in the main, are made from the following oils and fats:

Green olive oil or sulphur olive oil, an oil rich in olein, making a soap that finds favor as a scouring soap because of its free rinsing. Used in scouring raw wool, wool yarn and wool pieces, for degumming silk, silk-cotton and wool-silk materials, valuable as a soap for almost any purpose. Its use is almost universal in the textile industry and it is universaly liked. Leaves the goods with pleasant odor and does not discolor. Produces a high-grade soap.

Yellow olive oil—a more expensive oil for preparation of a soap used particularly in silk finishing. It is not important when the amount used is compared to the amount of soap made from green olive oil. Price is prohibitive.

Oleic acid or red oil—a widely varying product—used for scouring soap, almost completely replaced by green olive oil soap when the price of the latter is within reason.

Corn oil foots and cottonseed foots soap in various grades of differing color and odor; used for wool scouring and really a lower grade soap. Corn and cottonseed oil (not foots) would be satisfactory chiefly for potash soap, but their wide use as edible products has made them too valuable and their price too high for use in textile soap.

Tallow and palm oil are used in boiled and cold made soaps that find more use in fulling than in scouring. These oils are also used in mixtures with each other. Greases of various types are blended with tallow and palm soap chiefly in the making of boiled soap. Tallow and grease soap rich in stearin are widely used in the form of chips in laundries. Many of these soaps are filled with silicate.

At times cocoanut oil and rosin might be used in a mixture with other oils.

As has been intimated, textile soaps are of two types:

1. Boiled soaps in which the fat and lye are boiled together. This class includes both soda and potash soaps, the latter made chiefly from the liquid fats such as olive oil foots, red oil, corn oil, etc. Potash soaps find favor in raw wool scouring, back-washing of tops and in a general way for use in scouring. They have greater solubility than the soda soaps, which gives them added advantage in being freely rinsed from material after scouring. Most of the boiled soda soaps would be separated in a lye, while all the original materials remain in the potash soap. The vast majority of all textile soaps are made by the boiled process.

2. Cold-process or cold-made soaps as they are commonly known, in which the fat and lye are mixed, are mixed at low temperatures and all the constituents of fat and lye stay in finished soap. Cold-made soaps are usually produced from tallow of fairly good grade or palm oil, and are in many cases filled with silicate, etc. The disadvantage of the cold-made soap is the liability of incomplete saponification of the fat without the use of excess of alkali. It is easily possible to have free fat and free alkali in the same soap. The free fat is liable to lead to rancidity and the free alkali to have a deleterious effect on wool or colors with which it is brought in contact.

All soaps for textile purposes must fulfill the requirement that they will do their work satisfactorily and at the same time contain nothing that will injure the fibers on which they are used. Soaps in textile work are used on but two classes of fibers, the vegetable and the animal; cotton, on the one hand, and wool and silk, on the other, being the most important representatives of these classes.

The animal fibers are very sensitive to the action of alkali, particularly to caustic alkali, which causes a rapid deterioration of properties: luster, brightness, handle, etc. In this connection we might state that wool is more sensitive than silk, and that the action of alkalies is more harsh the finer the grade of the wool.

Cotton and vegetable fibers, as is well known, resist the action of caustic alkali in such quantities as might be found in soap. Unless the soap is used on cotton containing dyes (print goods, etc.), strongly alkaline soap can be used on cotton without any effect on the fiber and perhaps to an advantage.

Of course, soap is built up with alkalies to increase its efficiency. Care must be taken and judgment used in control of the amount of soap used, amount of alkali used and the temperature employed and the duration of the treatment. It is easily possible to use the correct soap incorrectly.

Textile soap should do its work without imparting an odor or color to the material on which it is used.

As you have noticed, textile soap has two main uses, the first and most important one being scouring (used with nearly every fiber) and that of fulling. Both processes are largely physical in their action. The properties of a scouring soup have been outlined. The best liked soaps for fulling are those made of palm oil or tallow, solutions of which give heavy body gels on cooling. These are made up about 2 ounces to the gallon, with addition of varying quantities of alkali, not caustic, the gel being applied to the cloth and the rubbing action started. Fulling or milling is mechanical in character, the fibers being interlocked during the treatment by pressure, heat and moisture. The greasy nature of the soap lubricates the fibers and allows them to slip over one another, while the alkali elevates the wool scales and allows them to interlock.

After all is summed up, there seems to be quite a little left to the individual in choice of soap which one seems to think best for a textile purpose. It is easy to go into one mill and find them using olive oil soap for scouring and palm oil soap for fulling, and then to turn around and find another plant using palm oil soap for scouring and olive oil soap for fulling.

The speaker has found tallow soap at times used for scouring silk in spite of the wide use of olive oil soap for this purpose. That there is lack of standardization in use of soap is true—green olive oil, potash, red oil and sometimes corn soap might and are used for raw wool scouring. Who can question the judgment of men when we consider the wide differences that occur in the quality of the textile fibers, the nature of the processes and the result to be obtained?

SOME PRACTICAL FACTORS IN THE SELECTION AND USE OF DETERGENTS

By J. F. Tonn

Sales Manager, Oakley Chemical Company, New York

As practical men engaged in or directly interested in the wet finishing of textiles you are all aware of the fact that methods are equally important as, if not more important than, materials used. The method of using a detergent is just as important as the properties of the detergent itself in determining what results will be obtained. The best detergent available for any particular operation if improperly used is not likely to produce results which are in any way superior to those obtained with an inferior material correctly used. On the other hand, a high quality material when properly used will invariably produce high quality results. The fundamental principles involved in the various wet finishing operations—whether they be kier boiling of cotton goods, scouring of woolen yarns or piece goods, degumming of silk, or scouring of artificial silk—are familiar to those of you engaged in the supervision or performance of such work. The skill of the textile finisher depends upon his knowledge of fibers and fabrics, his knowledge of correct procedure in processing various fabrics and his knowledge of what he can accomplish with the various detergents he has available. Such skill is acquired through years of sound practical experience and is usually supplemented by study of information available on the practical experience of others engaged in similar work. The finisher who handles the same class of goods regularly is able to standardize his methods and feel reasonably sure of uniform quality in his finished product. He has a much simpler problem than the man who handles a great variety of work for the trade. In spite of all the care exercised it is often necessary to refinish certain lots of goods which do not come through satisfactorily the first time. In either case, however, good judgment in regard to methods and materials to be used is essential for producing satisfactory results.

Detergents are judged on the basis of the results they produce, and on the cost of producing proper results with them. Manufacturers of detergents can and do supply materials which have been proved by practical experience to be effective. When such detergents are sold under a trade-mark it is imperative that the materials be kept absolutely standard in quality—otherwise the reputation of the material and the manufacturer will suffer. The results obtained with any material will depend almost entirely on the skill of the finisher in applying it. It is not our purpose here to discuss methods, as that is the field of the practical finisher. We wish, however, to call attention to some of the practical factors to be considered in selecting and using a detergent.

Soaps constitute one important class of detergents. Free fatty acids which become converted into soaps by the addition of alkalies are, of course, grouped with them. Scouring oils, which differ from soaps in that they are not thrown out of solution in hard water, may

also be classed with them. We shall limit ourselves to a consideration of the desirable characteristics of detergents ordinarily spoken of as soap builders—that is, materials used in conjunction with soaps to assist them in their cleansing action, prevent them from being precipitated by water hardness, and also exert a cleansing action of their own. When the fabrics being treated are practically free from solid impurities and only oils containing some free fatty acid are present, such materials are frequently used alone without soaps or scouring oils.

Soaps play an important part especially in the finishing of wool and silk fabrics, but the proper use of suitable assistants makes possible appreciable savings without in any way detracting from the results. In the use of soaps a persistent lather is usually recognized as an indication that sufficient soap is present in the scouring solution to give proper results. The use of soap in larger quantities than this is wasteful and also undesirable, for reasons which will be referred to later.

The characteristics of a good detergent of the soap builder class are that it must be—

1. Non-injurious to the fiber.
2. Effective for the removal of oily and fatty matter.
3. An efficient water softener.
4. A readily soluble material.
5. A material effective at low concentrations.
6. Free from material which will have an undesirable effect on subsequent operations if not completely removed.
7. A material low in cost.

To fulfill the first of these requirements the detergent must contain no free caustic alkali, especially when used in the finishing of woolen, silk and artificial silk fabrics. Even the alkaline carbonates, when it is necessary to use them at high concentrations to obtain effective cleansing, are severe in their action on these fibers and produce a harshness of finish which is readily detected by the practical finisher and also by the commission merchant and buyer. There is truth in the statement that the finish sells the goods. While the buying public is not always discriminating, the wholesale buyer invariably is.

The second requirement—effective removal of oily and fatty matter—is equally important. Such matter must not only be readily separated from the fiber, but also retained by the solution. Where such matter is of a vegetable or animal origin, soaps can be used sparingly or even entirely dispensed with. A typical example of this class of work is the scouring of knitted fiber silk fabrics. Neatsfoot or similar oils are present in fairly large quantities, but the fabric contains little if any solid foreign matter. A practical illustration of the difference between the action of two different detergents on such work was recently experienced. The methods were identical with both materials. With one material results were sometimes good, but greasy spots and streaks would frequently occur. It was impossible to obtain uniform results. Careful examination of the fabric also revealed the fact that small greasy globules adhered to the inside surface of the knitted tubing. Obviously the trouble was due to failure of the detergent to remove and retain the oils present. A change in the detergent used resulted in a considerable improvement. The greasy matter did not remain on the inner surface of the fabrics, but the results were by no means perfect. Stains and streaks still occurred.

It was realized that the material in use left some greasy matter on the sides and bottom of the tub, but investigation revealed a situation much worse than was imagined. The accumulation of oily, sticky, putty-like material was surprising. Thorough cleansing of the machine resulted in entirely overcoming the trouble. Oils were thoroughly removed from the fabric with the new detergent. The results were beautiful. A decided improvement in the softness of the finished fabric was obtained. A saving in time of processing was made, and the depositing of grease on the sides of the tub was prevented, and the machine was therefore in a clean condition. Greasy spots and streaks disappeared entirely.

It is very seldom that water conditions are ideal. The finisher with an abundant supply of soft water free from dissolved organic matter or suspended mineral matter all the year round is fortunate. Modern methods of water treatment will correct faulty water conditions, but it is not always possible to convince the management of the immediate necessity and economy of such procedure. The occurrence of suspended matter is usually intermittent and temporary, and is easily recognized. Dissolved mineral matter is, on the other hand, not so obvious, but is more troublesome, because it converts soap into insoluble matter which is retained by the fabric. This occurs especially when water containing such matter is used for washing out surplus soap after the scouring has been completed. Temporary hardness—hardness due to dissolved carbonates—is removed by lime as used in the old lime soda process of water softening or by caustic soda, but such materials cannot be used for reasons already stated. The alkaline carbonates are ineffective for the removal of temporary hardness, which, unfortunately, occurs more frequently than permanent hardness. When mineral matters causing both temporary and permanent hardness are present only, the permanent

hardness will be effectively overcome by materials such as soda ash. The burden of removing the temporary hardness will fall on the soap, which is only about one-tenth as effective as a suitable detergent of the soap-builder class for this purpose. The result is actual loss of soap and formation of the very objectionable insoluble soap which is removed with difficulty. Washing out after scouring is greatly facilitated by the use of a detergent which will satisfactorily overcome both temporary and permanent hardness. The use of soap in quantities greatly in excess of that required to produce a persistent lather is not only wasteful, as previously mentioned, but also undesirable because of these facts. It is preferable when washing out soap with hard water to first soften the water by the addition of a suitable material. Only a material which can cope with both temporary and permanent hardness will produce results which are satisfactory. It is preferable to use water treated by the modern filtration method, but such equipment is not always at hand. The water hardness then becomes a practical problem which must, for the time being at least, be solved by the detergents used.

A detergent should be readily soluble in order to make thorough removal of it easy after it has served its purpose. Ready solubility also helps to prevent the tendency for the fiber to absorb and retain the material. Briefly, the detergent must be free-rinsing. This characteristic reduces the time required for washing out after scouring, and is especially desirable where the supply of suitable water is limited.

A material which is effective at low concentrations is also desirable for the above reasons. The smaller the quantity of material required the easier and quicker will be its removal after it has done its work.

Even though extreme care is used occasionally, some material is apt to be retained by the fabric. For this reason it is desirable that the material be of such nature that it will not prove injurious to the fabric when concentrated by drying nor detrimental to the securing of uniform action in subsequent operations. Blotchy and uneven dyeings can often be traced to the fact that rinsing out of detergents was not complete. Precipitated soaps are usually responsible in such cases, but the soap-building detergent is indirectly responsible if it is of such nature that it cannot effectively prevent them.

Last—but by no means least in importance—the detergent must be a material low in cost, though not necessarily low in price. The prices of materials used in the cleansing of textiles vary over a considerable range, but difference in price does not always mean a difference in cost of using. In fact, it frequently proves to be true that the higher priced material is more economical than the lower priced. Price must be considered together with effectiveness in determining the cost of using any material. The argument that a high-priced material is wasted just as fast as a low-priced material is a fallacy and confession of improper methods. The competent finisher follows the prevailing practice of dissolving all detergents in water to make a stock solution which is used as required. This assures rapid and even distribution of the material throughout the goods to be treated. If a high-priced material is sufficiently superior to be more economical when properly used, correspondingly dilute stock solutions can be used and the established practice in the wash-room need not be disturbed in any way. The only change made is in the quantities of material used in making the stock solutions.

Cost is not always determined only by the relative quantities of detergents required. The discovery of a more effective detergent will sometimes make possible a considerable saving in the time required for processing, with a corresponding increase in the production with equipment available. An excellent illustration of this fact is found in the kier boiling of cotton goods. It has in a number of cases been found possible to secure as good results in one eight-hour boil as were formerly obtained with two eight-hour boils, by merely making a change in the detergents used. The saving in fuel required for boiling a five-ton load—one ton of coal—is always more than sufficient to cover the slight increase, if any, in cost of detergents required. The production of the kier is doubled if the bleachery is run only on day shift and increased about 50 per cent if both day and night shifts are run. Results are equally as good as, if not better than, under the two-boil system.

TEXTILE MILL CONUNDRUMS*

By John J. Sokolinski

Chemist, Arabol Manufacturing Co., New York

I will start off with a few remarks on the subject of peroxide bleaching, which I happened to be working with when it was really in its infancy. The peroxide bleach first was only a neutralization of sulphuric acid with sodium peroxide in water. It contained a small amount of iron. We thought at that time it was necessary to use sodium oxylate to take care of the iron.

In the bleaching of wool, the bath was alkalined with ammonia. This we found very unstable and it was necessary to re-alkaline the bath. As the time went on, we found out that we could eliminate the sodium or potassium oxylate which we had used to take care of any

*A paper delivered extemporaneously before the New York Section of the American Association of Textile Chemists and Colorists and reported by the Master Reporting Service.

iron, and we changed our alkali from ammonia to borax. From borax we obtained very satisfactory results.

Then we changed from borax to sodium tri-phosphate which, until about two years ago, really gave the best results. That is, as far as it was then known. At the present time we use sodium silicate, but the bath is first neutralized with sodium tri-phosphate. That is, after the sulphuric acid is added to the water, it is almost thoroughly neutralized with sodium peroxide, but it is best to leave it slightly acid in order that there isn't any caustic; that is, with the sodium peroxide.

So we leave it slightly acid and then we neutralize it with sodium tri-phosphate and then alkaline; otherwise there will be a precipitation of silicic acid in the bleach bath which, of course, will be detrimental to the material.

In trying to compete with sodium peroxide bleach against chloride of lime on cotton goods, we always found that sodium peroxide was by far more expensive, so we went to trying to bleach in the kier. It seemed rather odd to try to bleach in an iron kier after we were so careful about neutralizing, adding sodium oxylate to take care of the very small amount of iron that was in the sodium peroxide at the time, but in order to try to compete, we started bleaching in the iron kier.

Our first trials were what we call a combination bleach. It consisted of using about one pound of sodium peroxide to 100 pounds of material with sufficient sulphuric acid to neutralize the peroxide, to which was added about three pounds of sodium silicate. We packed the material in the kier and used this combination bleach, which seemed to work very satisfactorily. However, after we had taken out the first batch we found it was all streaked with yellow. Although the kier was whitewashed we really thought it was the iron. Hence, we emptied out the kier and pickled it, so to speak, with a solution of sulphuric acid, nitric acid and hydrochloric acid—27 parts of water, 5 parts of concentrated sulphuric, 13 of nitric and 2 parts of hydrochloric. This we boiled in the kier for three-quarters of an hour. This made the kier perfectly clean. After that we whitewashed it. Of course, we whitewashed it the first time, but as I said, the material was streaked with yellow streaks showing tests for iron, and we thought that probably the kier was not properly coated or was not properly cleaned.

For the whitewashing we slacked 15 pounds of lime. In order to make sure it was thoroughly slacked we allowed it to stand overnight. Then in the morning we added 3¾ pounds of salt. This we found to be one of the best kier coatings in our experience. We entered a second batch with the combination bleach. We took out the second batch and it was also streaked. So we hardly knew what to do. Then we examined the stones that we had used to hold down the material. We used granite rocks or stones, but not very large, for it was only a small kier. In one we found a very small hole which led to the center of the stone and in the center there was a putty-like mass which contained considerable iron and clay. After we had eliminated that stone we didn't have any trouble.

I thought that was a pretty good point to bring out as it is rather an odd and unusual thing. After discarding that stone it was all right; and to-day they are using the combination bleach in quite a few mills, although I question whether it can compare with the chloride of lime bleach as to cost. Of course, on something like Turkish toweling or things where the material is soft it produces very satisfactory results, but with Egyptian cotton or anything on that order which is pretty hard to bleach, I believe chloride of lime will produce better results.

I will make a few remarks on the bleaching of cotton-silk. This was gum silk; I cannot give the exact grade. We found that in bleaching the silk it turned from a cream color to a decided brown if left in the bath too long. Then, if we took it out too soon, the cotton was not white enough. Then we decided to partly degum the silk and then bleach the cotton-silk hosiery, figuring that the gum would take care of the silk, and then reboil after. So we bleached the cotton to the desired shade with the sodium peroxide bleach and alkalined with sodium silicate.

After the material was taken out the cotton was a fair white and the silk looked pretty good. Then we boiled off the silk. The silk looked fine and the cotton looked good, but the splicing in the heel, which was cotton, and the silk over the splicing, was yellow; it did not match.

So we made further trials. First, we degummed the silk; then we bleached the material. We tried using sodium carbonate. We tried using sodium phosphate and also sodium silicate.

The best result was with the one-quarter per cent sodium silicate. Then we tried increasing the amount to one-half per cent. This was still more satisfactory. Then we took a three-quarters per cent silicate. We found that the higher silicate gave the best result.

So it really looked as if the colloid in the bath protected the silk. We continued making trials, bringing the percentage of sodium silicate up to 1.4 per cent, in a one-half per cent peroxide bath; that is, four pounds to 100 gallons, and carried it over a little beyond the neutral point. When we brought it up to 1.4 per cent, we did not have one bit of trouble with the silk turning yellow or brown.

Can anyone really explain the action? I cannot. I cannot explain why the silk turned dark. The silk remained perfectly clear and the cotton was also perfectly clear with a high percentage of silicate. We completed

the operation by using Methyl Violet in a very weak soap solution, first working it cold in order to blue the silk and then heating it up in order to get the color on the cotton and got perfect results. So the best results were obtained by using a very high percentage of sodium silicate in alkalining the bleach bath.

In making trials in a machine containing some brass we boiled the material with a weak solution of caustic and the material seemed to be all right. Then we bleached it. The parts in contact with the brass turned a decided blue. Naturally the caustic acting on the copper and the material was very weak.

Then we changed our method of boiling and used a weak per cent of sodium silicate with a very small per cent of sodium carbonate. We boiled it for four or five hours and then bleached with sodium peroxide alkalined with sodium silicate and all the trouble was eliminated.

If anyone can give reasons for the points I have brought up I should certainly appreciate it.

COLLOIDS IN THE MECHANISM OF CLEANSING*

By F. H. Guernsey

Chief Chemist, Cowles Detergent Company, Lockport, New York

In cleansing operations colloidal detergents are called upon to effect removal of foreign matter, which is for the most part insoluble in water and chemically inert.

To remove substances which possess neither solubility or chemical reactivity, it is obvious that the particles must be loosened or dislodged and then suspended in the cleansing bath. If the substance should happen to be a liquid the suspension is termed an emulsion.

It is very seldom in practice that we encounter a single type of dirt, the latter usually being of composite character.

These suspensions or dispersions owe their existence to certain phenomena which are exhibited strongly by many colloids—hence the logical application of the latter in cleansing processes.

Surface Tension

Surface tension or interfacial tension is a disturbing quantity which must be reduced to facilitate wetting, since wetting power is largely dependent upon a low interfacial tension.

Alkali soap solutions, with their low interfacial tensions, have high wetting powers. High wetting power is usually accompanied by foaming. A foam is essentially an emulsion of air in the solution, and assists in cleansing by producing internal agitation and lifting dirt particles into the interface between water and the colloidal detergent, which is scattered or dispersed throughout the liquid in ultramicroscopic particles.

Adsorption

Adsorption is the concentration of a dispersed substance between two phases. It is a form of loose chemical combination as distinguished from chemical combination in the ordinary sense. In cleansing processes, the colloidal detergent is adsorbed upon the dirt particles, coating them with a more or less viscous film.

All the textile fibers are colloidal systems and the general theory is that most foreign matter is held to the fiber by adsorption. It is clear, then, that in cleansing, the detergent must be adsorbed more strongly by the dirt than is the fiber and displace the latter. The fiber-dirt adsorption complex is replaced by a detergent-dirt complex. In the presence of air, the greater adsorption of the detergent displaces the former, allowing the solution to wet the solid dirt and fiber.

The detergent-coated particles now separate from the fiber and drift away from the fiber zone.

Coalescence of the particles is prevented when the adsorbed film is of adequate thickness and durability. It is well to point out here that one of the chief causes for exhaustion of a cleansing bath, such as a soap solution, is due to adsorption of detergent upon the dirt particles.

When the ratio of dirt to colloidal detergent is high, so much detergent is adsorbed that the solution becomes proportionately dilute in active colloid. If the solution is allowed to become too weak in active colloids the suds value falls and a possibility of settling or flocculation of the suspended particles exists.

Brownian Movement

All colloidal solutions exhibit the so-called Brownian movement of the dispersed particles, when viewed under the ultramicroscope.

The particles are observed in rapid oscillation without regard for direction, and the phenomenon is considered a visible symbol of molecular bombardment. When these particles become attached to dirt particles, the motion is slowed to some extent; but when the colloidal detergent concentration is properly maintained, it continues. This incessant movement is of value in maintaining distribution or suspension of the particles throughout the liquid and retarding separation or settling.

Mechanical agitation applied from outside sources is

*A paper read before the New York Section of the American Association of Textile Chemists and Colorists.

of great value in maintaining the suspension, but in relatively still cleansing (kier boiling of cotton), internal colloidal agitation should not be underestimated.

The time element is important in this action, and more is accomplished where the dirt is exposed to the detergent solution for several hours than where it is a matter of minutes.

Turning to Fig. 1, we have a graphic representation of a cleansing problem. A typical cluster or aggregate of dirt is shown, held together by a combination

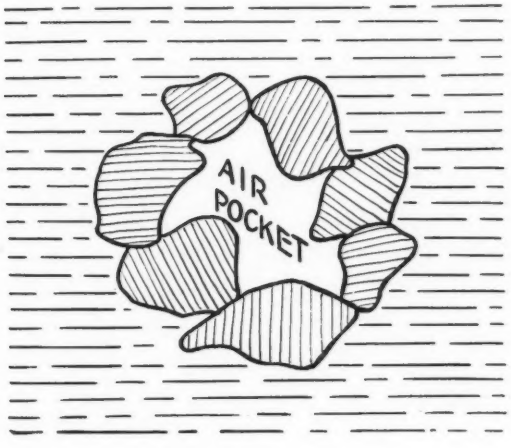


Fig. 1

of surface energy and a film of greasy dirt. The spaces between the particles are filled with air, which must be displaced. The cluster must be broken up, the individual particles dispersed and prevented from reassembling into aggregates.

Fig. 2 shows these same individual units properly dispersed and in condition to be rinsed away. The air pockets have been displaced, the cleansing solution is in contact with (wetting) the surface of each particle, and a film of adsorbed detergent coats each surface. If the concentration is properly maintained this suspension will persist until the solution has been discharged.

Fig. 3 shows the result in case the cleansing bath is allowed to become exhausted (concentration of active colloid diminished to critical point) or become subject to some other destructive influence.

The units again aggregate, but in the flocculate thus formed the spaces between the particles are filled with

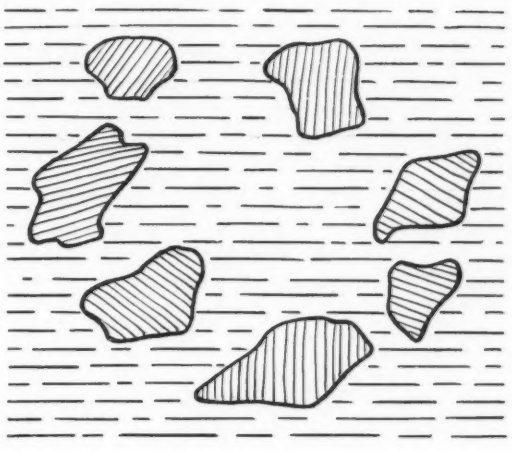


Fig. 2

solution instead of air, as was originally the case. Settling of the clusters will occur at once unless the solution is reinforced, but a lesser amount of detergent will be required to repeptize the dirt, because the surfaces are already wetted and the air has been displaced. As the suds value usually falls simultaneously with aggregation of the particles, this fact is employed in practice as an indicator of the activity of the solution.

It has been stated that the textile fibers are colloidal systems and the bearing of the fact upon the cleansing process should not be overlooked. That colloids possess low diffusibility is well known, and the ability of

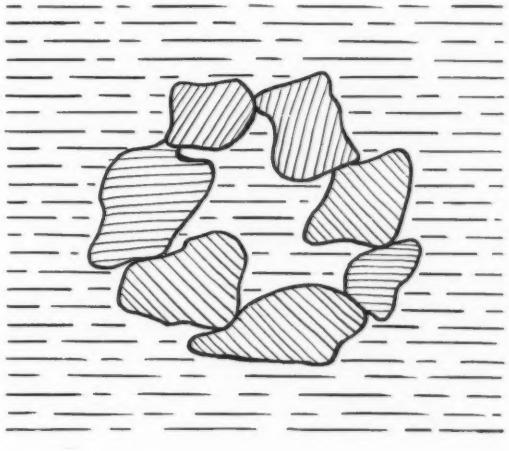


Fig. 3

a colloidal solution to diffuse through a colloidal membrane is extremely limited.

Soap or other colloidal substances will not diffuse into or penetrate the fiber interior. This probably accounts for the fact that soap and other colloids are the least destructive, as none of the material remains *in* the fiber to disorganize its structure.

The raw non-colloidal alkalies, such as soda ash or caustic soda which are frequently used alone or with soap, easily pass *into* the fiber. It is not an easy matter to rinse *out* this alkali which, upon drying, is concentrated there to disrupt the fiber structure. Souring is often resorted to, but the products of neutralization, too, often remain to exert a similar destructive action.

In our laboratories, we have observed that the addition of a colloid to an alkaline solution will appreciably lessen the destructive action of the alkali salts present. This is probably a case of hydroxly ion adsorption by the colloid. Alkaline compounds which supply the necessary alkali under the safer influence of colloids are available on the market.

The use of organic solvents finds many applications where the greasy type of dirt predominates. Where other classes of dirt are associated to any extent, it will be noted that benzene-soluble soaps are used for the production of foam and some colloidal adsorption produced through slight hydration of the soap by moisture in the material scoured.

An extended discussion of the ultimate details of colloidal processes in cleansing has not been attempted here. Enough has been shown, however, to impress one of the importance of this branch of chemistry in textile processing.

DISCUSSION FOLLOWING THE READING OF PAPERS AT MEETING OF NEW YORK SECTION, SEPT. 28

Reported by Master Reporting Service

The Chairman—Now, gentlemen, the meeting is open to you for discussion on the various papers that have been presented. I am sure that the gentlemen who have presented them will be very glad to have you ask any questions you would like or make any comments on what they have contributed.

I would like to ask one myself. I would like to ask some of the gentlemen how extensive has become the use of various detergents that make use of organic solvents of one kind or another? Professor Bertolet, will you answer that?

Professor Bertolet—I can't say much about that except that the growing use of phenol compounds in the scouring, particularly in conjunction with soap, is marked.

There is another product, the name of which I have forgotten, I am sorry to say, that has been recommended. But the first thing I mentioned is, perhaps, the most prominent step that has been made in the last three or four years. I believe that if we look back over old records we will find that it is really derived from the English. We find patents that speak of the use of phenol compounds as assistants in scouring wool.

The product, whose name I cannot remember, is from Germany. I don't know much about it, but it strikes me it was supported by one of the dyestuff importing companies. Maybe some one else here can speak of it.

The Chairman—Mr. Tonn, have you any information on that score?

Mr. Tonn—No, I am not familiar with that kind of a solvent in any operation other than in connection with metals. Those solvents are frequently used where the alkalies are not suitable, in the metal trade, but I am absolutely unfamiliar with it in connection with the textile industry.

However, I just call to mind something that I did run across a year or two ago. There was quite a campaign made for certain cereal soaps by a concern in connection with the textile industry, and particularly the laundry trade, but it completely died out after a time and I have not heard anything of it in months. It was a cereal soap that was put out and patented. Great claims were made for it. I came in contact with it in one or two places. The objection was the same in each case, that it seemed to decompose rapidly and was responsible for a very objectionable odor in the material that was treated with this soap.

The Chairman—Was it a liquid or a solid?

Mr. Tonn—It was a dry compound.

Mr. Sokolinski—There was a product on the market called ZAP. It was in powdered form and sold very cheaply. I don't think it was worth very much.

Mr. Tonn—I think they went out of business, although I am not quite sure.

Mr. Sokolinski—They advertised in the National Laundry Journal about five or six years ago. Then there was another one, KEN. That was made somewhere on Long Island, I believe. It was supposed to be made from corn, but I don't know just how much tallow was in it. I believe it is a tallow soap with cornstarch incorporated in it, which is very easily done.

Dr. Flynn—The use of solvents, I think, is quite extensive in the cotton industry in connection with scouring, in the form of preparations of sulphonated oils and pine oil and solvent naphtha or mixtures of those things. I think it is very common. They are very extensively manufactured as bleaching assistants; so extensively used, in fact, that there must be some merit in their use. Similar preparations are used in dyeing operations for wetting out unbleached cotton. I should say that was a very extensive use of solvents.

I don't know just what the theory is exactly. I think

it is generally explained that these solvents somehow or other combine with the cotton waxes and render them more easily emulsifiable. They seem to have merit at any rate, however they operate.

Mr. Silverman—I might add to what Dr. Flynn has said because we happen to be in that line and we make and sell quite a good deal of compounds which do contain coal tar solvents. The real action there is that the solvents act on the natural waxes or so-called pectins which are found in the cotton and by the use of these solvents a whole lot of alkali can be cut down. That is, by using a certain small percentage in the bleach as an assistant, the one who is using it can do away with quite a good deal of alkali. There is a considerable quantity of it used.

Mr. Goldman—Those solvents, being soluble, are able to dissolve much quicker than ordinarily. Referring to the phenol that the gentleman mentioned, while it is unsaponifiable in water, in conjunction with soap it is perfectly saponifiable. It is supposed to be a very good product for scouring. It is supposed to be very efficient.

Mr. Wood—I think the product referred to was probably carbon tetrachloride. I believe that is a similar compound to those that have been mentioned by the different speakers. I don't know just exactly what its constitution is, but I think it is one of the higher hydrocarbons.

I have tried Penatrol in boiling off silks and particularly cotton goods because, while in silks you don't have to contend with impurities of a mineral nature very much because silk is only prepared with olive oil, in cotton that is used for cotton and silk mixtures there is contained, besides pectin matter, mineral oils and other unsaponifiable oils which are put in to facilitate the spinning process.

While I believe it might be useful in a kier, we didn't find it very useful or we couldn't determine to our own satisfaction that it was very useful in boiling out silk and cotton goods.

With regard to the rest of the papers that have been given, I found them all interesting and particularly this dissertation on the relation of colloidal chemistry to scouring which, I must admit my ignorance, is a new thing to me. I have seen some little discussion of it, I think, in the American Dyestuff Reporter. I think they had an article before by Mr. Guernsey.

Mr. Howes—There was a series of five or six articles by Mr. Guernsey.

Mr. Wood—I think I remember reading them. This is put in a very short and terse way. The crux of the situation is put before us in a very able manner and not too complicated.

I think there is probably a good deal to be said for both theories and I think that a combination of the two methods (that is the effect of the colloid solution and some other kind of an alkaline detergent) probably is the solution of the problem, because in the case of nearly every fiber we find we have two kinds of impurities to deal with. They are the impurities existing in the fiber itself and the impurities which occur in the fiber on account of processes through which it has passed in the previous operations of manufacture.

So we have rather a complex problem. We try to overcome one difficulty, and we jump into another. I think the Doctor has correctly stated it in that the problem consists in using a detergent to remove the impurities and then getting rid of the detergent itself in the best manner possible. We have a choice of two courses in the good work we want to do, very much like the little boy who was a Boy Scout who had promised, as all Boy Scouts do, to do one good act each day. He was in bed one night and couldn't sleep because he remembered that he had not done his good act for that day. So he finally got up out of bed and went downstairs and fed his two white mice to the cat. (Laughter.)

Mr. Aronowski—I would like to ask the speakers a question. What percentage of free alkali, in their opinion, would prevent the use of a soap in washing woolens in a laundry?

Mr. Tonn—If I may be allowed to answer that question, Mr. Chairman, I don't think you can wash woolens in a laundry with alkalies or anything else without the use of a soap and do it successfully. By "woolens" I imagine you mean chiefly blankets, which is the most serious problem that any laundry has to meet in its work.

I have done a good deal of work in connection with that. The best results are invariably obtained by a low temperature and a corking good soap, with an addition of a small amount of a mildly alkaline cleaner and a very small amount at that. The colder you can keep a solution and still get the wool cleaned the better and softer wool you will get; but if you add alkali to it your wool will shrink and become harsh.

I think that is a problem that every high grade laundry man who makes a specialty of washing blankets and woolen goods is up against. All the experience I have come across among those who have been successful in it is that they have used as nearly neutral a high grade soap as possible, and kept the temperature of their solution in the wheel down and agitated as little as possible—the least agitation possible commensurate with good washing.

Dr. Flynn—I might suggest to the gentleman that the Mellon Institute put out a very handy little volume on laundry practice that the questioner might be interested in having. I think it would answer all those points. It is well worth anyone's having.

Professor Bertolet—Mr. Chairman, if you will allow me to have the floor again, I would like to say I was very much interested in the description of the peroxide bleach. Some of those effects that our friend got have been my experience. I have a nice lot of wool down in the place that has those beautiful red spots that he speaks of. It was carried out by my assistant and the same thing happened again. I can't say exactly what caused it. Instead of getting a good bleach it looks like an uneven brown, a red shade of brown. To this day I have not solved that problem.

Regarding the use of silicate of soda, I have found that you will get better whites with silicate than you will with any other alkali. There is something different about silicate of soda in peroxide bleaching.

Again I will say that the use of metals in a peroxide bath will accelerate bleaching to such an extent that a spot of iron rust on a silk stocking, or silk-cotton stocking (either on the top on the cotton or on the silk) will cause so rapid a bleaching as to put a hole right through the material at that point. There is an acceleration there. I have two or three samples at the place that show it.

In fact, ten years ago I carried out a few tests. They were not elaborate tests, but I found that if you took solutions of alum and added to the bleaching bath and carried out another test, without alum, alongside of it, your bleach with alum in the solution was more rapid.

It seems that it accelerates bleaching. Of course, if you use a metal in the acceleration it must be some metal that will not harm the color of the material.

There are many interesting problems in connection with the peroxide bleach. You don't always get what you think you should get when you put your material in the bath. This brown stain is a common fault with peroxide bleaching.

Dr. Flynn—I might be allowed to remark that a woolen manufacturer told me just the other day that he used peroxide in dyeing underwear. I possibly can find out just how he proceeds to do it, but he gets a brownish cream color effect on the wool by the use of the peroxide. He must have solved the method of controlling it.

The Chairman—He makes use of the defect?

Dr. Flynn—Yes, actually.

Professor Bertolet—If you look into it, it might be an oxide manganese which is oxidized with the peroxide. Take from the lower oxide to the higher oxide—I have heard of such a tint on underwear forming the lower oxide, and then oxidizing with the chloride of lime or peroxide to the higher point, which is a darker oxide.

Dr. Flynn—The color was sort of pinkish. I saw some of the stuff. I would not believe that he produced it with peroxide, but he swore up and down that he did and with nothing else. He bought the material on the market and had it analyzed. The chemist reported that it was nothing but a solution of peroxide of hydrogen.

Professor Bertolet—I don't want to monopolize the floor, but there is a method of bleaching hosiery after it has been dyed. For instance, I have seen some effects in cotton-silk hosiery where the cotton heel and toe had been dyed and then the material bleached afterward. Of course, the dyer would make that just somewhat heavier than the finished shade, but it seemed satisfactory.

I think, if I rmember correctly, that there was also a blue produced with an acid violet and a green which underwent the same kind of treatment. The silk was dyed and then the cotton-silk babies' and young girls' stockings that they roll down, with the heel and toe of silk and a band of silk right near the top like the Scotch lassies. They were dyed and then bleached afterward. I believe the dyer got those results by making them a little heavier in shade and then having them stripped down somewhat in the bleach bath. Details of that process I have not at my fingers' ends.

Mr. Sokolinski—We have found from experience that if the vat is not thoroughly bleached out before bleaching the material in it, it will take the color from the wood and seem to set it on to the wool fiber. Then in stoving, if the wool is not thoroughly extracted, if it is too wet, the parts that touch in the stoving will become dark brown and also from wooden grates. If it is left to drain for several hours, the stain from the wood will go right into the wool.

Professor Bertolet—It is very possible that that is the answer to our trouble and that the kettle that was used had been idle for some time.

Mr. Sokolinski—Before we use a tank like that we always give it a good boil and then a very light bleach; then proceed.

The Chairman—Once the stain is in you don't know how to take it out?

Mr. Sokolinski—You can get it out—that is, if it is not in too far. You can bleach it out as a rule, if it is a stain from the wood, with peroxide. I am not in the peroxide bleaching game now, but it looks like I am advertising it.

Mr. Wood—Could not this peroxide treatment have produced the light brown shade? Could that have been a process of developing?

Dr. Flynn—I did not see the process carried out. He sent me a piece of the goods and wanted to know how this same color could be produced, and, of course, I was curious to know how he produced it, and he said he produced it with hydrogen peroxide.

Mr. Wood—Perhaps that was the oxidizing process.

Dr. Flynn—He swore up and down that he didn't use any chemical.

Mr. Wood—He probably meant that he didn't use any dyestuff. That isn't a dyestuff.

The Chairman—There apparently being no further discussion I suggest that we adjourn.

NEW SOURCE OF INDUSTRIAL ALCOHOL

(*Continued from page 758*)

is that the farmer has no means of turning surplus or waste products into sources of revenue.

The utilization of wastes and incidental products has been developed in manufacturing industry to the last degree. The meat packing interests are said to utilize every part of the animal except the squeal, and it is no secret with many industries that the by-products carries the load. How stands it with the farmer? When crops are good, prices go down, and he must sell at less than the cost of production. When blight or drought occur, when floods drown his land or insect pests visit it, he finds himself with something worth less than nothing; which actually costs him money and heart-breaking labor to remove from his fields.

Yet ready to hand, there is a remedy. We have attested by the greatest scientific experts, and demonstrated by long years of experience a simple means of utilizing all the waste and surplus crops, of the American farmer, to such advantage as will place him on a high plane of prosperity and contribute in enormous ratio to the material well-being of the whole country. Everything that grows upon the farm—grain, fruit, berry or melon—can be turned into industrial alcohol at a price which would yield the farmer a handsome profit. And this refers not merely to the sound products; it applies with equal or greater force to the blighted mildewed grains, unripe or rotten fruits and berries, to the melons that spoil upon the vine before they can be picked.

Seventeen years ago the Congress of the United States removed the revenue tax from industrial alcohol. It was expected that farm distilling would reach an enormous scale and that the farmer would benefit tremendously. But nothing of the kind happened, for the governmental bureaus in Washington, for reasons that may be suspected but not expressed, proceeded to tie the farmer up with a mass of regulations (No. 61 of the Volstead Act), so complex as to be impossible of interpretation and so expensive in their requirements, that no man earning his living from the soil could attempt to comply with them. Indeed, so onerous are these regulations that even heavily capitalized commercial alcohol distilleries find it well-nigh impossible to do business under them and the number of such plants is diminishing year by year. When I say that more than seventy forms, some of them in quadruplicate, are required of the producer of industrial alcohol, some idea of the official obstacles is gained.

Alcohol is the very best fuel for internal combustion motors. An average farmer out of his wastes and spoilages could produce an ample quantity to run his automobile, his tractor and his other farm engines and still have a surplus left to sell at a remunerative price. Given the proper adjustment of the auto motor and alcohol is 30 per cent more efficient than gasoline. A bushel of potatoes whether of the best or lowest grade will produce a gallon of alcohol. Spoiled grapes, or rotten apples will do even better. Two and a half gallons of this wonderful fuel and energy source can be produced from a bushel of spoiled wheat or corn.

Before the Great War, Germany, under sensible regulations, had more than 70,000 farmer community stills turning out industrial alcohol. To-day this product is selling at retail in Great Britain for 25 cents per gallon as a motor fuel and in Cuba for from 9 to 12 cents a gallon for the same purposes. France is using it in automobiles and so are Holland, Hungary and other countries.

If the farmer wants to make himself rich and benefit the whole country by giving it a cheap and efficient fuel, let him demand that Chapter III of the Volstead Act be repealed and the regulations issued thereunder be abolished, that the production of industrial alcohol be placed under the Department of Agriculture and that the regulations be written into the law, so that the ignorance or prejudice of bureau officials cannot thwart the development of what should be one of the greatest and most beneficial industries in the country.

Congress is very much in the mood to listen to the farmer. Let him demand his rights.

(Signed) E. S. BROUSSARD,
United States Senator from Louisiana.

THE LUCAS PHOTOMICROGRAPHIC CAMERA

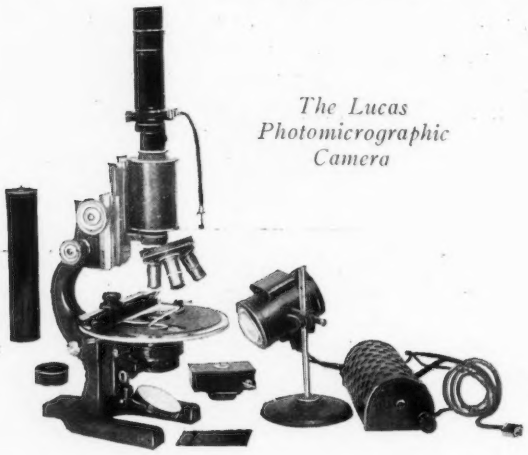
A new microscopic photographing device has been perfected by F. F. Lucas, an engineer, experienced in the field of technical microscopy and photomicrography. It is simple in design; economical in operation; and yields results of a high order. No special skill or training is necessary on the part of the user other than that possessed by the average worker in the field of microscopic investigation.

The camera consists essentially of four parts: an adaptor for mounting the instrument on a microscope and for bringing it into the exact position desired; a shutter with two interchangeable extension tubes; a roll film and plate container; and the focusing and visual observation device which is interchangeably mounted with the film and plate container.

In operation the eyepiece is removed from the microscope and the adaptor slipped over the draw tube. If the eyepiece is of the ordinary type the extension ring is not needed, but if a compensating or other eyepiece is used, which projects well above the end of the draw tube, the extension ring is screwed into the adaptor. The shutter with either the short or long tube extension, as desired, is next screwed into the adaptor or its extension ring, as the case may be. With the adaptor loose on the draw tube the camera will rest on the eyepiece, because of a positioning ring or collar attached to the lower face of the shutter. If an eyepiece is not used with the

microscope, the positioning ring will rest on top of the draw tube. Tightening the knurled thumb nut of the adaptor locks the instrument securely to the draw tube. With the shutter open, the focusing and visual observation device is slipped into the extension tube and an image secured on the ground glass in the usual way by focusing the microscope. Any suitable source of illumination may be used. When the desired field is located, the light centered and uniformly adjusted, the shutter is closed and the focusing device removed.

In using a film, the film container is loaded as for an ordinary camera, precautions being taken to keep the slide closed. The film is wound forward under an appreciable drag to secure proper tension and keep the film taut in the area under exposure. This drag or tension is caused by the film clips which act as brakes. The ratchet winder will operate clockwise only when in inward position. The actual flattening of the film is accomplished by drawing it between



The Lucas Photomicrographic Camera

resilient mountings, so that it is securely clamped everywhere except throughout the area under exposure. The loading and the discharge of the roll film are carried out in daylight in the same manner as for ordinary roll film cameras. The shutter is operated either "Time," "Bulb" or "Instantaneous," as best suits the preparation to be photographed. The draw slide is closed and the container removed from the extension tube. The film is then wound forward to the next position.

If it is desired to use a plate, the film clips are removed. The loading is then carried out in the dark room or by means of a large bag. The plate is slipped beneath the retaining springs of plate holder. This is then dropped face downward into the container and the back of the container replaced. The plate holder covers the peep hole in the back of the container and thus prevents the plate from becoming light struck. The draw slide, of course, should be kept in the closed position until ready for exposure.

The advantages claimed for the instrument are: 1. Uses standard roll film or plates; 2.. Less affected by vibrations; 3. Exact longitudinal adjustment assured; 4. A visual observation or demonstration instrument; 5. A method of micrometry adapted to field counting; 6. Compactness; 7. Ease of operation.

SILK ASSOCIATION AIDS JAPANESE TESTERS

Machinery for the testing of raw silk, now a part of the equipment of the Shanghai International Testing House, was offered to the Yokohama silk officials by the Board of Directors of the United States Testing Company, Inc., recently.

Following cable advices from D. E. Douty, general manager of the company, who has conferred with the Yokohama silk interests, the board met in a special session at the rooms of the Silk Association. Mr. Douty was instructed to offer all machinery not required for actual business in Shanghai to the Yokohama officials.

While this equipment will not by any means replace the loss suffered by the Yokohama Imperial Conditioning House, it will in part make possible the resumption of silk shipments in Yokohama and will give the Japanese silk industry a working supply of apparatus.

The machinery offered includes conditioning ovens, sizing reels, skein balances, sizing balances, serimeters, gage machines, cohesion machines, and all equipment found in the modern silk testing laboratories.

PRODUCTION OF SYNTHETIC ORGANIC CHEMICALS IN CZECHO-SLOVAKIA

Translated from the Prager Press, Prague, Czecho-Slovakia

"The chemical industry is one of the youngest industries in Czecho-Slovakia. Until very recently Germany supplied practically the entire market, but at the present time an independent chemical industry is growing up. The Aussiger Chemische Verein has successfully produced alizarine colors, some azo colors, and sulfogene black. We understand that research is being undertaken on synthetic indigo colors, for which the coal-tar production at Ostra is a good basis. This industry has great significance, as it can, if necessary, be easily changed over to the production of medicines and explosives. It is also rumored that the company is thinking of undertaking the large scale production of nitrates from the air."

It is understood that the German Dye Trust has not only failed to deliver its reparation contracts of dyestuffs to the Czecho-Slovakian Government, but that since the occupation of the dye factories by the French, they have not been able to fulfill the trade agreement between Germany and Czecho-Slovakia wherein the German Government pledged itself to facilitate the shipment of aniline, tar, synthetic indigo and several other dyestuffs.

THINGS EVERY TEXTILE CHEMIST AND COLORIST SHOULD KNOW

(*Continued from page 756*)

When using the gooch or the sieve this is very rapidly accomplished.

The cotton residue is well agitated in a wash water, and squeezed in the fingers several times, and then transferred into a second fresh bath of water. After this washing it may be immersed into very dilute hydrochloric acid to neutralize last traces of alkali, and is then well washed to remove the acid. In the last wash water, which may well be distilled water, a little ammonia helps to neutralize the final acid present. When taken from the distilled water the cotton residue is squeezed and may be put directly into a drying oven, or, to save time in drying, may be put into denatured alcohol, and finally into ether. Most of the ether is allowed to evaporate from the sample on a warm surface before it is put into the drying oven. (When working with the alcohol and ether it is very necessary to have all free flames removed.) The residue is dried to constant weight in the oven, cooled in a moist free atmosphere and weighed in a closed container. There is thus obtained the weight of bone-dry cotton which was in the original sample.

In computing the results of analysis several steps are necessary depending upon the corrections applied and upon the systems of reporting employed. With both procedures, as described, the original samples were weighed in the air-dried or normal state. The carbonization process leaves the bone-dry wool, the alkali solution process the bone-dry cotton.

The computation of the analysis by the alkali method will be described and illustrated. The weight of bone-dry cotton found is frequently increased by 5 per cent of its own weight to allow for the loss in weight suffered through the action of the alkali upon the cotton. This gives the corrected bone-dry weight.

The analysis may be reported in two systems—either upon the "air-dried" basis, as received, or upon the "bone-dry" basis as determined. To report upon the air-dried basis, the moisture free cotton actually weighed may be exposed to the moist air of the laboratory for several hours to allow it to "regain" its full amount of natural moisture and then be reweighed to obtain the air-dried weight of the cotton residue. There will be added to this the 5 per cent of its own weight for the action of the alkali. When it is desired to save time, the approximate air-dried weight of the sample may be computed by using a standard figure of 6.5 per cent (the accepted standard for regain of dry cotton). This figure is applied to the corrected bone-dry weight. The final corrected air-dried weight of the cotton residue thus obtained is compared with the air-dried weight of the original sample to determine the per cent of cotton upon the air-dried basis.

To report upon the bone-dry basis, the corrected weight of the bone-dry cotton (i. e., the 5 per cent added) is compared with the computed bone-dry weight of the original sample. This last computed weight is found by using the moisture figure obtained in the test for moisture.

An example of the computation in both systems follows:

(1) Moisture test—

Weight sample (air dried) = 11.309 grams
Weight sample (bone dry) = 10.669 grams

Loss in weight (moisture) = 0.640 grams

$$\text{Per cent moisture} = \frac{(100)\ (0.640)}{11.309} = 5.7 \text{ per cent}$$

Per cent bone-dry fibers = 94.3 per cent

(2) Per cent cotton, test: bone-dry system (slide rule computations)—

	(a)	(b)
Weight sample (air dried) =	11.671	12.703
Computed bone-dry weight =	11.00	12.00

found by dividing the air-dried weight by (100 plus 5.7), or by multiplying it by 0.943.

Bone dry-weight cotton residue =	3.601	3.941
Adding 5 per cent, or	0.180	.187
Corrected bone-dry weight =	3.781 gm.	4.138

$$\text{Per cent bone-dry weight} = \frac{(3.781)\ (100)}{11.00} = 34.4$$

$$\text{or } \frac{(4.138)\ (100)}{12.00} = 34.45$$

Average per cent cotton on bone-dry basis = 34.4 or 34 and 35 per cent.

(3) Per cent cotton air-dried basis—

Computing the same analysis upon the air-dried basis, allowing 6.5 per cent for moisture "regain," the figures are:

	(a)	(b)
Air-dried weights of samples equals..	11.671	12.703
Weights bone-dry cotton residues corrected for 5 per cent alkali action equals	3.781	4.138
Adding 6.5 per cent of these for moisture, the weights of "air-dried" cotton residue become.....	4.027	4.41

Per cent corrected "air-dried" cotton residue =

$$\frac{(4.027)\ (100)}{11.67} = 34.5 \text{ or } \frac{441}{12.70} = 34.7.$$

Average = 34.6 or between 34 and 35 per cent.

The remainder of the fabric would be counted as wool unless special tests have been made for other substances.

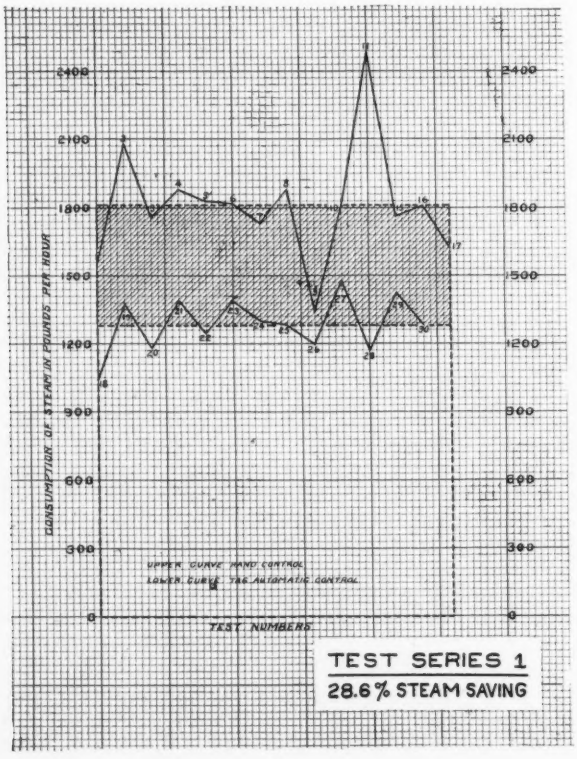
Automatic Temperature-Time Control for Piece Dyeing

Unavoidable Complexities of Dyeing—One Variable Factor Which Can Be Eliminated—Why Hand Regulation of Temperature-Time Is Inaccurate—Automatic Control Saves Steam—Importance of Temperature Recorders

By VICTOR WICHUM, M.E.

THE complexities of the dyeing operation itself are further involved by variable factors over which the dyer has no control and of the nature of which he is not even informed.

The original raw material will vary considerably and the operations which precede the dyeing operation are not always the same, either because of accidental irregularities or because of deliberate changes made in the scouring or crabbing processes. These changes are seldom brought to the attention of the dyer. He is given a product to be dyed and is expected to secure a definite and exact shade even though the product will vary widely as to dye-absorbing properties and characteristics. When the dyeing operation is considered with these difficulties in mind, it is easy to see why the experience, skill and good judgment of the boss-dyer can never be dispensed with.



On the other hand, if it is possible for the boss-dyer to eliminate any single irregularity in the dyeing operation itself, it would seem to be the obvious way of simplifying his already complex problem.

If any one of us were asked to determine the width of a piece of goods, it certainly would not reflect on our judgment if we measured it with a yardstick. A guess might be within an inch or two, but the accuracy of the yardstick would make it unquestionably the more exact method.

Time and Temperature Most Important Factors

Now two very important factors in dyeing are temperature and time. The boss-dyer realizes this because he, himself, calculates the proper temperature-time schedule for each set. If he then depends on hand-valve regulation to secure the desired results, he is trusting to guesswork when a very reliable "yardstick" is available.

The yardstick is nothing more than the automatic temperature-time controller, already in wide use on Rodney Hunt kettles in the dyeing of piecce goods, and on Hussong and Klauder-Weldon machines in the dyeing of yarn.

"Good Results" by No Means Perfect

When temperature-time control was first introduced, the following comments were usually encountered.

"My men can give me the schedule I want," the boss-dyer would say. But, as a matter of fact, the boss-dyer wasn't getting the schedule he wanted as recording thermometer charts would show. Confronted with the written proof he would then rejoin that even though the temperature and time was not exactly as he called for, he was getting "good results." But "good results," he usually would be willing to admit, included numerous

(*Continued on page* 778)

SERIES 3 STEAM CONSUMPTION TABLE USED IN DETERMINING 21% STEAM SAVING
AS CALCULATED BY PLANIMETER READINGS FROM BAILEY FLOWMETER CHARTS.

HAND CONTROL

Test No	Cloth	Fabric No	Number of Pieces	Total Yards of Cloth	Total Lbs of Cloth	TOTAL STEAM: DYEING: Coming up to boil: Lbs steam used	Coming up to boil: Actual time in min	Coming up to boil: Av steam pressure available	DYEING: At boil: Lbs steam used	At boil: Actual time in min	At boil: Av steam pressure available	At boil: Average temp	CHROMING: Coming up to boil: Lbs steam used	Coming up to boil: Actual time in min	Coming up to boil: Av steam pressure available	CHROMING: At boil: Lbs steam used	At boil: Actual time in min	At boil: Av steam pressure available	At boil: Average temp	Total Consumption of Steam in Lbs.	Total Actual Time in Min.	Average Consumption of Steam in Lbs Per Hr
5	Woolen 11oz blue	8670 -/- 32	8	446	300	1504.8	60	No gage	2695	74	No gage	209.	1249.6	60	No gage	2072.4	61	No gage	208.5	7521.8	255	1769.8
8	"	"	8	446	300	1727	60	58	2805	75	5.0	210.2	1628	60	4.9	1969.	60	4.1	210	8129.	255	1912.7
9	"	"	8	446	300	1716	60	5.25	2288	75	5.0	211	1639.	59	6.6	2101	61	5.5	211.5	7744.	255	1822.1
14	"	"	8	446	300	1155	60	4.8	2673	75	4.9	210.2	1518	60	5.0	1936	55	4.7	209.4	7282	250	1747.7
15	"	"	8	446	300	1617.	60	6.3	2684	75	5.3	209.4	1782.	60	5.1	1738	55	5.0	209.4	7821.	250	1877.
16	"	"	8	446	300	1287.	60	5.7	2398	75	5.0	209.9	1529.	60	6.4	1991	60	6.2	209.9	7205.	255	1695.3
18	Black Worsted	8241 -88	8	672	420	1595	60	6.3	1949.2	74	6.6	209.8	1551.	60	6.7	2123	60	5.4	211.5	7218.2	254	1705
19	Woolen 11oz blue	8670 -/- 32	8	446	300	1562	60	5.8	2585	72	4.8	209.1	1529.	60	5.1	2211.	58	5.1	210.6	7887.	250	1892.9
AVERAGE			8	474.25	315	1520.5	60	5.7	2509.65	74.375	5.23	209.8	1553.2	59.88	5.7	2017.68	58.75	5.14	210.1	7601.	253	1802.8

TAG AUTOMATIC CONTROLLER

Test No.	Cloth	Fabric No.	Number of Pieces	Total Yards of Cloth	Total Lbs. of Cloth.	TOTAL STEAM: DYEING: Coming up to boil: Lbs steam used	Coming up to boil: Actual time in min	Coming up to boil: Av steam pressure available	DYEING: At boil: Lbs steam used	At boil: Actual time in min	At boil: Av steam pressure available	At boil: Average temp	CHROMING: Coming up to boil: Lbs steam used	Coming up to boil: Actual time in min	Coming up to boil: Av steam pressure available	CHROMING: At boil: Lbs steam used	At boil: Actual time in min	At boil: Av steam pressure available	At boil: Average temp.	Total Consumption of Steam in Lbs.	Total Actual Time in Min.	Average Consumption of Steam in Lbs Per Hr.
1	Woolen 11oz blue	8670 -/- 32	8	446	300	1546.6	61	No gage	1678.6	72	No Gage	208	1573	60	No Gage	1540.	60	No Gage	208	6338.2	253	1503.1
3	"	"	8	446	300	1529	60	"	1744.6	73	"	207	1480.6	60	"	1441.	60	"	207	6195.2	253	1469.2
4	"	"	8	446	300	1287.	60	"	1661.	75	"	206	1535.6	60	"	1392.6	60	"	206	5876.2	255	1382.6
6	"	"	8	446	300	1375	59	5.1	1810.6	75	5.0	207	1436.6	60	5.0	1238.6	60	5.3	206	5860.8	254	1384.4
7	"	"	8	446	300	1485	60	5.5	1700.6	74	6.5	206.5	1353	60	6.5	1304.6	60	5.5	205	5843.2	254	1380.3
10	"	"	8	446	300	1568.6	60	6.5	1793	75	4.9	207	1458.6	60	5.0	1441.	60	4.9	206	6261.2	255	1473.2
11	Woolen blue	8242 -87	8	635	347	1238.6	60	5.5	1665.4	74	5.9	207	1463	61	5.9	1403.6	60	6.8	207	5770.6	255	1357.7
12	Woolen 11oz blue	8670 -/- 32	8	446	300	1425.6	60	5.0	1898.6	75	4.8	207	1546.6	59	5.1	1562	61	5.4	206	6432.8	255	1513.6
13	"	"	8	446	300	1397.	60	5.8	1628.	75	6.2	207	1458.6	60	6.6	1304.6	60	6.5	207	5788.2	255	1361.5
20	Brown	8670 -/- 34	8	426	293	1419	60	5.0	1859.	75	5.0	207	1507	60	5.0	2246.	103	5.3	205	7051.	298	1419
AVERAGE			8	462.9	304	1427.14	60	5.49	1743.94	743	5.47	206.95	1481.26	60	5.58	1489.4	64.4	5.67	206.3	6141.74	258.7	1424.5

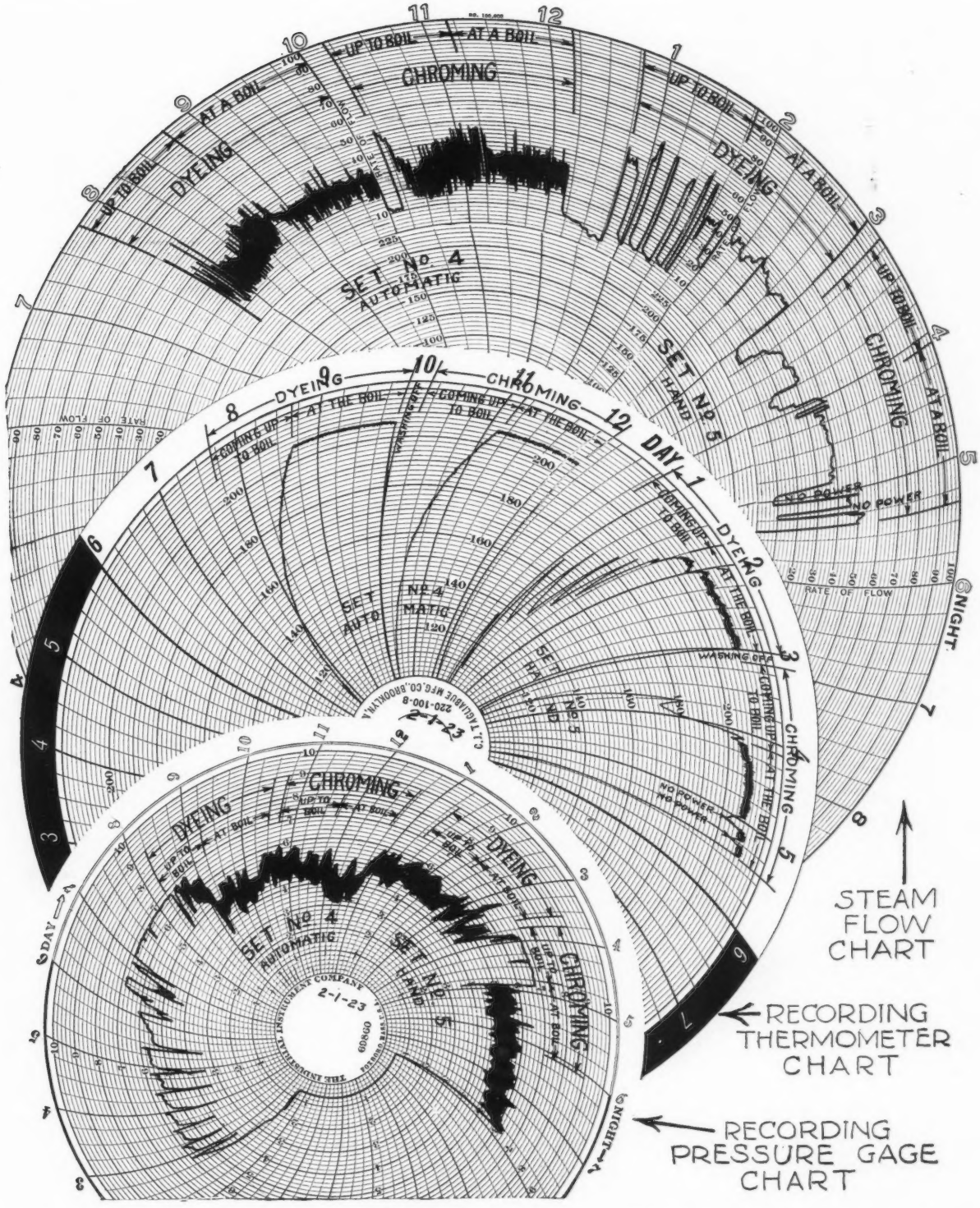
SERIES 2 – STEAM CONSUMPTION TABLE USED IN DETERMINING 21.95 % STEAM SAVING
AS CALCULATED BY PLANIMETER READINGS FROM BAILEY FLOWMETER CHARTS

HAND CONTROL

Test No	Cloth	Fabric No	Number of Pieces	Total Yards of Cloth	Total Lbs of Cloth	TOTAL STEAM. DYEING Coming up to boil: Lbs steam used	Actual time in min	Av steam pressure available	DYEING At boil: Lbs steam used	Actual time in min	Av steam pressure available	Average temp	CHROMING Coming up to boil: Lbs steam used	Actual time in min	Av steam pressure available	CHROMING At boil: Lbs steam used	Actual time in min	Av steam pressure available	Average temp	Total Consumption of Steam in Lbs	Total Actual Time in Min	Average Consumption of Steam in Lbs Per Hr.
36	50" All Wool	4040	24	848.2	414.43	2347	92	7.8	1140	47.0	6		874	27	8	1223	40	11		5584	206	1627
44	" " "	4040	24	857.3	418.88	2400	109	595	1028	37.5	6		744	22	9	3008	108	10.4		7180	276.5	1557
46	" " "	5200	24	864.2	411.70	2552	120.5	6.4	1130	34.0	6		806	23	9	944	27	12		5432	204.5	1593
48	" " "	4040	24	852.6	416.58	1678	83.0	6.9	1553	71.0	5.5		289	10.5	7	1686	58	7.8		5206	222.5	1407
34	44" All Wool	75	24	862.8	353.14	2250	101	6.2	1209	44.0	6.9		736	25	8	1845	59	9.5		6040	229	1583
42	" " "	75	24	846.6	346.51	2082	91	7.4	1731	64.5	7.8		538	15	9	1455	48	10.5		5806	218.5	1595
50	" " "	2043	24	857.3	315.45	1842	77	6.8	1662	77.	5		842	25	9	718	16	13		5064	195	1560
84	" " "	75	24	864.0	353.60	1588	595	12.	2458	90	7		512	16	10	1873	78.5	12		6511	244	1600
86	" " "	75	24	850.0	347.9	1290	63.5	7	2728	91.5	8		592	15	12	1710	59	13		6320	229	1655
88	" " "	75	23	818.0	334.8	1534	65.5	12.5	2258	95.	7		537	14.5	10	2211	73.5	11		6580	254.5	1551
90	" " "	75	24	858.0	351.1	2140	74.5	10.	2640	81	8		380	15	10	3110	115.5	11		8290	286	1738
32	36" All Wool	AWS	32	1138.2	366.16	3020	117	6.9	2034	81	5.42									5054	198	1530
38	" " "	3007	32	1185.3	414.62	2735	101	9.1	4530	155.5	14.4									7265	256.5	1700
40	" " "	AWS	32	1142.5	367.54	1551	69	6.2	2956	117	6.2									4507	186	1454
54	" " "	AWS	32	1134.0	364.81	1432	61	11	2642	114.5	9									4074	175.5	1393
56	" " "	AWS	32	1144.6	368.23	2761	106	8	2205	74.5	6.5									4969	180.5	1650
60	" " "	HWS	31	1130.7	363.75	1442	62.5	5.1	2730	126.5	7.1									4172	189.	1325
33	36" Cotton	HWF	24	839.6	260.2	1076	30.5	9.	2305	68.5	9.3									3381	99.	2050
35	" "	2818	24	839.5	274.0	932	26	9.	2152	62.	8.66									3084	88.	2102
37	" "	2818	24	848.2	277.1	788	28	8.	1990	74	7.									2778	102.	1635
39	" "	HWF	24	824.1	156.7	1187	37	10	1592	56	9.4									2779	93	1793
43	" "	2818	24	821.2	268.0	1018	27.5	10	1313	42.5	11									2931	90	1956
45	" "	2818	23	789.7	257.8	1052	36	7	2071	79	7.1									3123	115	1630
47	" "	HWF	23	784.8	187.3	1427	41.5	8	2683	86	9.5									4110	127.5	1934
49	" "	FYS	23	902.1	233.3	1194	36	11	2070	74	11.5									3264	110	1781
51	" "	2818	24	849.4	277.2	918	27	10	1826	54	11									2744	81	2032
53	" "	2818	24	839.7	274.0	1560	42.5	11	1735	51	10									3295	93.5	2115
57	" "	HS	25	884.0	208.3	1021	26	11.	2437	58.5	11.62									3458	124.5	1666
59	" "	HWF	24	825.7	197.0	953	30	8	1400	65.5	9.4									2353	95.5	1462
Average			25.5	907.0	315.9	1647.9	63.5	8.5	2036.8	77.0	8.3		622.7	18.9	9.2	1803.9	62.6	11.1		4667.4	171.4	1678.4

TAG AUTOMATIC CONTROLLER

Test No	Cloth	Fabric No	Number of Pieces	Total Yards of Cloth	Total Lbs of Cloth	TOTAL STEAM DYEING Coming up to boil: Lbs steam used	Actual time in min	Av steam pressure available	DYEING At boil: Lbs steam used	Actual time in min	Av steam pressure available	Average temp	CHROMING Coming up to boil: Lbs steam used	Actual time in min	Av steam pressure available	CHROMING At boil: Lbs steam used	Actual time in min	Av steam pressure available	Average temp	Total Consumption of Steam in Lbs	Total Actual Time in Min	Average Consumption of Steam in Lbs Per Hr.
61	50" All Wool	5748	24	859.4	420.	936	70	9.5	1676	79.5	13		451	14	12	1581	65.5	13.5		4644	229	1215
68	" " "	842	24	821.	386.2	1264	59	11	1953	92	8		311	8	12	1824	73	14		5352	233.	1377
70	" " "	892	24	859	409.1	878	45	10	1951	93	7		352	11	10	1886	73	14		5089	222	1386
71	" " "	899	24	860	410.	752	49.5	9.	1958	91	8.5		333	9	12	1810	67	15		4853	216.5	1345
60	44" All Wool	419	24	865.2	354	861	31	10.	3466	147	14									4327	178	1458
62	" " "	510	24	880.9	354	1228	74	9.	3950	157.5	12									5178	231.5	1341
64	" " "	471	24	866.	354.2	1077	51.5	11	1310	88.5	9		373	10	12	2140	85	14		5500	235	1404
66	" " "	609	24	866.	354.2	1285	59	12	1955	94.	9		378	10	12	1537	69	15		5155	232	1333
67	" " "	529	24	863.	353.1	1105	62.5	10.5	1928	90.5	8		254	8	10	2120	86	12.		5407	247	1314
73	36" All Wool	AWS	32	1133.	365.1	794	50.5	9.	2629	134	9									3623	184.5	1178
75	" " "	AWS	32	1148.	369.5	612	47	9	2322	121.5	9.5									2934	168.5	1046
77	" " "	AWS	32	1155.	371.5	1272	48	10.5	3770.	165.	8									4787	213.	1349
78	" " "	3007	32	1144.	400.	910	48	8.5	4200	194.5	9									5110	242.5	1265
79	" " "	AWS	32	1119.	360.	772	36	9.	2132	86	13									2904	122.	1428
80	" " "	AWS	32	1183.	381.	1064	47	11.5	3015	137	9									4079	184.	1330
63	36" Cotton	2818	24	823.1	240.5	732	31	12.	2845	123.5	14.									3577	154.5	1387
74	" "	2818	24	831.	263.	680	32.5	11	1942	92.	13.									2622	124.5	1265
76	" "	2770	24	827.	260.	479	31.5	11	2170	99	11.									2649	130.5	1218
81	" "	2770	24	838.	263.3	630	28	14	1605	69	12.5									2235	97.	1259
Average			26.5	944.4	352.0	912.2	47.4	10.4	2504.1	113.4	10.3		350.3	10.	11.4	1842.9	74.1	14.2		4211.8	191.8	1310.4



A careful study of these charts, taken during Test Series 3, shows graphically the advantages of automatic control. The smallest chart shows the steam pressure available at the kettle. Note the wide variations which add to the difficulties of temperature regulation by hand control. The second chart enables you to compare the temperature records obtained first by Automatic and then by Hand Control. The largest chart shows that when the Automatic Controller was in command, the valve on the steam line was constantly throttling, thus securing accuracy and steam economy.

redyes and occasional seconds which he has now found automatic control will eliminate.

Some interesting points are brought out in a comparison of hand-valve control with automatic control which prove conclusively the impossibility of accurate results with the old method.

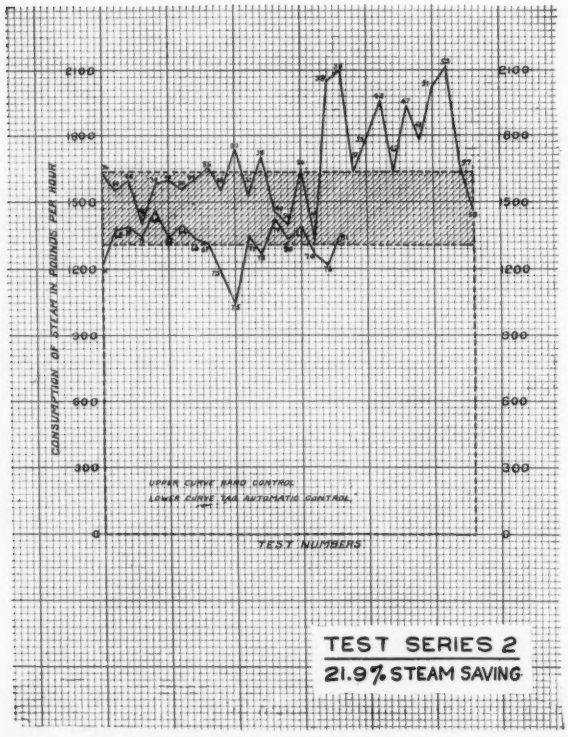
This is not because the attendant is careless or unskilled, but because of many variable conditions which he cannot or does not take into account.

Fluctuating Steam Pressure

One of these variables is the fluctuating steam pressure delivered to the kettle. But it may be said, "We have a reducing valve on our main steam header set for 40 pounds. Why haven't we uniform pressure?" The pressure available at any one kettle at any time, however, will be far from constant because of the varying demands of the other kettles.

The pressure variation at the kettle, is, no doubt, due to the fact that the header supplying steam to a row of kettles, is not of sufficient capacity when all of the kettles on the row demand a maximum amount of steam at one time. The header may have been of sufficient capacity originally, but from time to time more kettles have been installed.

This variation in steam pressure at each kettle is very pronounced when exhaust steam is used. Thus in Test Series 1, an indicating steam gauge which was installed showed a fluctuation of 3 to 8 pounds at the kettle. The attendant has no means of knowing when the pressure changes. He believes that 1½ turns of the hand valve will give him a boil in, let us say, one hour. This is only true if the pressure remains constant.



Sudden Changes in Temperature Dangerous

If the boil is reached in *less* than an hour, the rate of temperature increase has been too rapid and not all of the fibers will have had sufficient time to absorb the dyestuff. The mutual affinity of the fibers for the dyestuff exists only at certain temperatures, and greater or less grease or soap in the goods will increase or decrease this affinity. This affinity or chemical action of the dye is accelerated by a *sudden* rise in temperature and shady pieces result. Usually the sections of the piece close to the false front will be considerably deeper than the remaining sections which have not been subjected to the sudden temperature rise. The importance of reaching the boil in the exact time scheduled and by a *gradual* increase in temperature is apparent.

After the boil has been reached, it is necessary to maintain it gently in the kettle. With hand-valve regulation, the attendant can only follow his "rule of thumb" which is that a valve opening of 1¼ turns will keep up the boil. However, when the pressure fails, the temperature falls also, and consequently the gentle boil is not maintained. When the pressure increases, the boil is maintained, but more steam passes through the liquor than is needed.

Even assuming that steam gauges were installed just before the hand valve, and that a kettle man were in constant attendance at each kettle, it would still be impossible to counteract the pressure changes as they occurred with sufficient speed and precision.

Uniform Steam Pressure Alone Not Sufficient

A uniform pressure delivered to each kettle would not assure us that a 1½ turn of the hand valve would bring the liquor to a boil in an hour, or, that one turn would maintain a gentle boil, unless the initial temperature of the dye liquor, the height of the liquor in the kettle and the weight of the set were always the same.

The attendant gradually becomes accustomed to filling the kettle with water to about the same height before adding the dyestuff, but a difference in level only to the

extent of three or four inches means the heating of approximately 50 gallons more or less.

The initial temperature of the dye liquor varies appreciably. The attendant neglects this factor entirely.

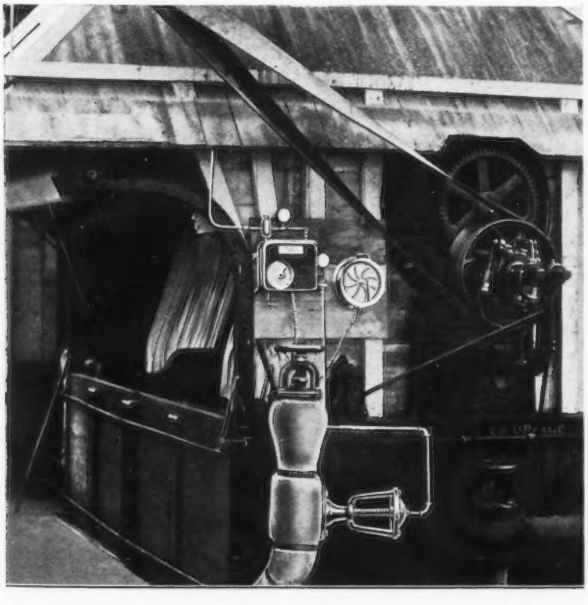
One set weighs more than another. The writer recalls seeing 8-piece sets that weighed as little as 300 pounds, and others that weighed 450 pounds. The heavier set carries more liquor with it over the reel and hence dissipates more heat units in the form of radia-convection.

Automatic Control Essential to Gradual Rise

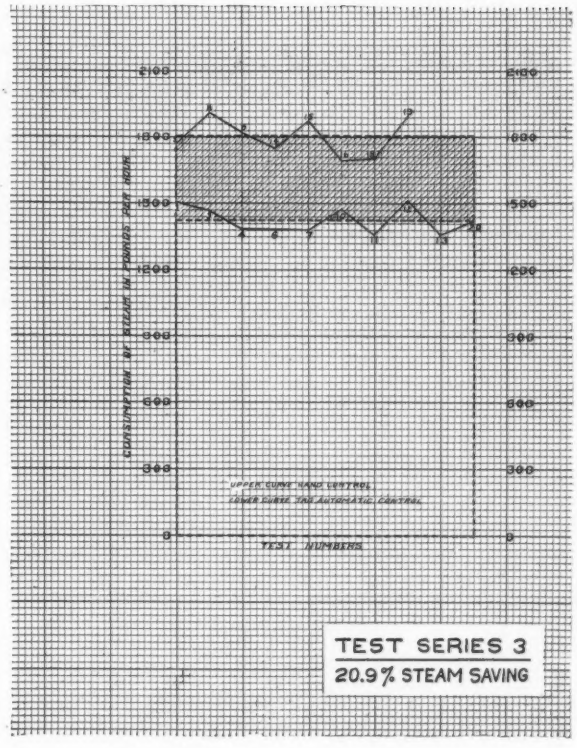
From these reasons, we can see that automatic temperature-time control is essential to obtain a gradual rise to the boil in the prescribed time, and uniform maintenance at the boil for the remainder of the operation. The easy adjustment of the controller which can be made at any time gives it a flexibility which should be emphasized.

Whether an actual boil is necessary is a question which has never been satisfactorily settled. Dyers have found that an automatic controller can be set to maintain a temperature lower than a boil and still obtain the results they desire. Of course, this effects a greater steam saving than other dyers obtain who set their controllers for an actual boil.

In either case, however, comparative tests have clearly demonstrated that automatic temperature-time control will secure remarkable steam savings as compared to hand-valve regulation.



Installation of Temperature-Time Controller and Recording Thermometer on Rodney Hunt Piece-Dye Kettle



Active Tests Show Steam Saving

Three series of tests were conducted by three of the largest dye houses in this country to determine the exact amount of such steam saving. The results are as follows:

Test Series 1 equals 28.6 per cent steam saving
Test Series 2 equals 21.9 per cent steam saving
Test Series 3 equals 20.9 per cent steam saving

Charts showing these results graphically are given herewith. Details of the observations and calculations of Test Series 2 and 3 also accompany this article.

Besides securing more uniform dyeing and saving steam, automatic control requires fewer attendants in the dye house and reduces the amount of condensation.

Recording Thermometers Assure Accurate Repetition

In conclusion, it would be well to point out the extreme importance of attaching recording thermometers to dye kettles. The charts obtained should be indexed and filed for future reference.

The one great problem in dyeing is the ability to repeat a previous success obtained with a certain schedule and formula, especially in starting a line at the beginning of the season. Automatic temperature-time controllers and recording thermometers will make this possible, and besides securing more uniform dyeing will save steam and effect other economies.

MEN OF MARK
in the
DYESTUFF FIELD

RALPH F. CULVER
Vice-President and Manager of Providence Office

CIBA COMPANY, INC.

RALPH FARNSWORTH CULVER was born in Groton, Mass., where he received his preliminary education in the public schools of the town.

In 1901 he entered the Lowell Textile School, and graduated in 1904 after completing the course in Chemistry and Dyeing.

He spent a little more than one year as chemist at the Glenlyon Print Works, and late in 1905 went with the Arnold Print Works, North Adams, Mass., as assistant dyer, and about one year later was promoted to superintendent of dyeing.

In September, 1908, he became manager of the Holliston Mills at Norwood, Mass., and after four years at this plant he accepted the position of manager of the dyeing departments of the Joseph Bancroft & Sons Company, of Wilmington, Del.

Mr. Culver's chief desire, during his associations with textile mills and finishing plants, was eventually to enter the dyestuff field, which he did in 1916.

In February of 1921 he joined the forces of the Ciba Company, Inc., which was incorporated at that time, and was made manager of the Providence office. During the latter part of 1922 he was made a director of the company, and has recently been elected vice-president.

He is keenly interested in the activities of the American Association of Textile Chemists and Colorists, being Chairman of the Providence Section and ex officio a member of the National Council. He is also a member of the Society of Dyers and Colourists and of the Providence Engineering Society.

AMERICAN DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY

PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL.

Directing Editor

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ENTRE NOUS

YOU hold in your hands what we honestly believe to be from every standpoint—bulk, appearance, worth of text matter—the finest single issue of any color publication ever produced in America. It is a far cry from the little weekly newspaper of sixteen pages in six-by-nine size which was The REPORTER three years ago to The REPORTER of to-day.

The development during this time has been most gratifying to the publishers. It has been possible, we believe, because of the loyal support of firm friends who have appreciated our endeavors to serve the industry.

Our early effort was entirely centered in the development of a self-contained American dyestuff manufacturing industry. To-day we can look with pride upon that industry and all that it has accomplished in so short a space of time. Our part in its development, however infinitesimal, will always be one of our chief sources of gratification.

In all our efforts on behalf of the American dyestuff manufacturer, however, we have never for a moment forgotten that it is the consumer who dominates, and always will dominate, the industry. Whether dyes are made here or abroad, the production of dyed fabrics will go on unabated. Hence, it is the consumer who must be our first thought, and whom we must honestly strive to represent. In so far as we succeed in representing him fairly and in making his problems our problems we will approach the goal which we have set.

THE DYESTUFF DEMONSTRATOR—IS HE AN ASSET?

TIME was when the technical service offered by the manufacturers of dyestuffs was indispensable to the proper understanding and use of coal-tar dyes. These coloring mediums were new; their characteristics and qualities were but imperfectly understood by the mill dyer. Accustomed as he had been for generations to the use of mordants and the natural extract dyes, he needed guidance when it came to the application of the new coal-tar colors which came in rapid succession from the German laboratories subsequent to 1872.

From this unquestionable necessity arose the system of technical application service which was developed to such a point of perfection by the German houses that it might be fairly said their technicians not only produced and distributed the dyes, but controlled the subsequent application of them by the mills. Especially was this the case when in obedience to the vagaries of fashion the demand for unusual shades led to the blending and mixing of dyes which, to-day, constitutes a very large element in the science of dyeing. In those early days few, even of the larger mills, employed chemists or dyers who were technically trained, and the dye user was thus almost entirely dependent upon the dyestuff manufacturer and his distributing agencies for technical information.

When the necessity for producing its own dyes was forced upon this country by the stress of war conditions, this was the situation which confronted those who first essayed to meet the demand. A well-organized application service appeared to be essential, and great emphasis was laid by the leading dye manufacturs on their ability to supply it. The German example was followed, and application experts were freely offered to supplement the salesmen's work and to instruct the mills in the proper use of the new American-made products. The American dyestuff industry, however, as it comes more and more into adequate being, is confronted by new and changing conditions. Almost all the larger mills now employ competent chemists and colorists. These men have worked out their own practical methods of application, and nearly every mill has its own secrets of manipulation, of blending, or of finish, on which its reputation is established, and which it is essential to guard from successful imitation by its competitors.

There are still, of course, a great many mills which are not so fortunately situated in regard to possessing proper technical talent, and in these cases it will unquestionably be necessary for some time to come to have the dyestuff manufacturing concerns coach the dyer on proper application methods for their products. This editorial aims to consider, however, the situation as it exists in the larger and more progressive mills, which, in the aggregate, consume at least three-quarters of the dyestuffs sold in this country.

From the standpoint of these larger mills—and when we say larger, we mean to imply the possession of competent technical supervision—it, therefore, becomes a question whether the application expert sent out by the dyestuff manufacturer to give instruction in the application of his dyes is any longer needed—whether he is of real value to the consumer and an asset to his employers.

Many textile chemists with whom we have discussed this question maintain that the application expert gets more from the mills to which he is ostensibly rendering technical service than he gives. It is inevitable that the information which he acquires after spending days or

weeks in the dyehouse of a customer, should be looked upon as practical knowledge, useful to other customers and should thus be passed on as part of the service offered by his employer. In other words, the application expert admitted to the dyehouse of a customer becomes familiar with methods of which he quickly appreciates the value, and which, however good his intention, he is likely to use to establish competition against that customer. Many instances of this sort have been brought to our attention from time to time, but, perhaps, one or two concrete cases will serve to illustrate the point.

Some time ago a well-known hosiery dyer developed a method of finishing which materially improved the quality and appearance of hosiery dyed with sulphur black. After it had been carefully guarded and used exclusively for some time the process was patented. In the course of his work in the dyehouse of this concern the process in question became known to an application expert representing a manufacturer of dyestuffs, and this concern, with the very proper and laudable desire to give the best possible service to its clients, and not knowing that the process was patented, sent out a circular to its customers calling attention to the method and its value. In this case the dyestuff manufacturer, upon being notified by the hosiery concern of the facts, very promptly withdrew the circular, with apologies.

Another more recent instance was that of a well-known dyeing establishment which developed a special method of using a certain class of dyes on cotton piece goods. While the creating of the process was to the credit of the mill chemist, it was thought advisable in perfecting it to have the co-operation of a technical expert from a dyestuff manufacturing concern. Today the process is offered by that dyestuff manufacturer as a method of his own.

The mills welcome and, in fact, require technical information as to the qualities and characteristics of dyes which are offered for sale, but there is an evident disposition on the part of the leading mill chemists and dyers to discourage the appearance of the application expert, who so often takes away more than he leaves, and who, in his natural anxiety to give good service to the next customer, can hardly be expected to do otherwise than utilize all the knowledge he can acquire. This situation has been recognized by certain branches of the dye industry, and in at least one section of the country, eastern Pennsylvania, the principal hosiery dyers have notified the dyestuff manufacturers with whom they do business that they do not care to receive visits from application experts, but that, while they appreciate and expect all necessary information concerning the properties of dyes offered to them, they prefer to work out their own practical mill problems without assistance.

In our conversations with various leading dyestuff manufacturers we have been led to believe that the manufacturers themselves regard the employment of application experts as one of the most valuable services which they can render to the consumers, and one which can be depended upon to produce a great deal of good-will for them among their customers. After discussing the matter with several technical mill men of unquestioned ability, however, we are wondering whether the good-will created in some instances is not more than offset by the ill-will created in others. It is a question of very considerable importance to both consumers and manufacturers, and one upon which we should be very glad indeed to receive expressions of opinion from our readers.

AN OPEN LETTER TO A DYE EXHIBITOR

JUST before the hour for opening the show, when you have completed the arrangement of your display to your utmost satisfaction; after you have stepped into the aisle to view your booth as others will see it—after that, go to a point in the building where you can look down upon the expanse of floor, at the booths and displays spread out below. Let your eye rove to right and left over the partitions, search out your competitors' booths and absorb the bright, colorful displays. Then it will not be difficult for you to imagine the Exposition as a vast picture of PROGRESS. For that is what it is, actually as well as figuratively.

For ten minutes allow your own pride, pride in your company, in your exhibit and in your product, to be lost in serious consideration of the *entire* industry that you represent. Take a broad, sweeping view of the situation; consider the dye industry in relation to this country's progress; consider its growth, its rapid advance from an obscure beginning to its present position of international importance.

Look down again at the great looms, spindles and warping machines; the sight of them ought to bring more forcibly to you the vital importance of the American dye industry when combined with the American textile industry. Between these two there should be co-operation, like hands and feet, like the rows of upper and lower teeth. In such co-operation lies success for both.

Did you ever stop to consider that warping and carding, spinning and weaving, bleaching and scouring all go for naught if, in the final process, the dye falls down; that one last inferior result destroys the product of the whole industry? This puts a big responsibility on your shoulders. Your competitor may labor successfully to perfect some new color or some novel process, but if you fail he feels the effect. Consumers lose faith in American dyes. Destructive rumor and pernicious propaganda seize upon each failure or mediocre achievement to question anew the competency of the American dye-making industry.

A potent force working against insidious rumor is represented by these expositions; they are educational

factors aiding the welfare of the industry. You in your booth are the temporary educator of the public. Yours is a twofold duty—to demonstrate the service you have developed in the interest of the consumers and to destroy and dispel the dangerous prejudices which have arisen with the growth of the American dye industry.

The 1922 Dye Census

Large Increases in Tonnage and Value Reported—Exports Also on the Increase—New Types Developed

IF it were not for the hard-working statisticians industry would be laboring in the dark. Tables of figures are cold logic, which no sensible, appreciative person ever thinks of disputing. One feels confident that one can turn to census reports and be certain of learning something of value, something that will indicate with cool precision the fluctuations of the industry in which one is engaged.

For this reason, if for no other, the 1922 Dye Census should be given careful perusal by all those desiring to satisfy their convictions as to how the American dye industry is actually progressing.

The United States Tariff Commission deserves a chorus of praise for the concise yet thorough manner in which it has rendered this latest dye census report. Statistically, it satisfies almost every requirement of the industry's executive division. In addition to the tables showing production, sales, imports and exports, there is included an enlightening summary giving comparative figures for 1922 and previous years. There is something of special note in every paragraph of this summary.

For instance, it is highly interesting to read that dye production increased 66 per cent over 1921. The production by 87 manufacturers totaled 64,632,187 pounds. The pre-war production by seven firms was only slightly over six million pounds. Again, the sales figures for 1922 show a remarkable increase—69,107,105 pounds representing a total value of $41,463,790, over 22,000,000 pounds more than the previous year's sales.

The general increase in production and sales for the year was mainly due to the nationwide business revival. Beginning about June, 1922, the report says, textile and other dye-consuming industries showed signs of increased activity after a business depression, and during the remainder of 1922 the demand for dyes steadily increased.

The average price for dyes produced in 1922 dropped 28 per cent below that for the previous year. Sixty cents was the average price per pound, compared with eighty-three cents for 1921 and a dollar and twenty-six cents in 1917. This large reduction affected all classes of dyestuffs in large and small quantities.

The production of vat and alizarine dyes showed a remarkable increase—200 per cent over the previous year's figure. High prices in the cotton market resulted in the use of the best available colors, even at slightly larger cost to the manufacturer.

Intensive laboratory activity resulted in the production of many important new dyes for silk, cotton and wool. As a further result, imports had a noticeable decline. It is manifest that the answer to the foreign competition problem lies in the laboratory. Obviously American consumers are only too willing to use American dyes if they can get them. The report points out that the domestic industry lacks vat dyes and certain of the mordant, acid and direct colors. Concentration in these fields would doubtless prove that American chemists can be counted upon to supply every need.

A quotation at this point from the census report would not be irrelevant:

"The satisfactory quality of American dyes is one of the evidences of the progress made by the domestic industry. Dye for dye, with relatively few exceptions, the domestic product is the equal of the pre-war German product."

The report further says that shortly after the outbreak of the war, when the American dye industry was beginning to organize, some criticism was heard of the lack of uniformity as to strength and quality of the dyes produced. Doubtless there was at that time some ground for such assertions, but those conditions are now practically unknown. Testimonials from textile manufacturers agree as to the satisfactory results obtained from American colors.

Total imports of coal-tar dyes in 1922 were 3,982,631 pounds, valued at $5,243,257, showing a reduction from 1921 figures of over 270,000 pounds. The imports for 1914 came to 45,950,895 pounds, an enormous figure when contrasted with that given for 1922.

Germany supplied 44 per cent of the 1922 dye imports, a reduction of over 3 per cent from the previous year. Switzerland supplied over 43 per cent, 5 per cent came from England, 4 per cent from Italy, and 2 from all other countries.

Another drop is indicated by the export figures for the year, a 90 per cent decline from those of 1920. The total exports for 1922 amounted to 6,956,593 pounds, for a value of $3,023,127.

It is reassuring, however, to note that 1923 exports have increased considerably, due largely to the French occupation of the Ruhr. The exports for only the first four months of the year came to 5,456,812 pounds, within a million and a half of equalling the entire exports for 1922.

There have been very encouraging developments in the field of coal-tar chemical research. During the past five years the industry has expended over twenty-one million dollars on extensive investigation in the manufacture of dyes. Research budgets were reduced last year, but it is hoped that when domestic business recovers its activity, this important branch of the industry will function to even greater advantage.

This Census report also gives the figures for the pro-

duction of Synthetic Organic Chemicals other than those derived from coal-tar as totalling 79,202,155 pounds, and the sales, valued at nearly twelve million dollars, as 60,494,494 pounds.

A new feature of the 1922 report is the section devoted to the international dye trade. It consists of a summary of conditions in the dye industry in all of the larger coal-tar producing countries, together with the tables listing dye exports and imports of each of those countries for 1913, 1920 and 1921. There is a very interesting comparison showing the remarkable decline in Germany's dye exports from the period before the war, when she controlled 88 per cent of the world's dye trade, up to the development of a greater dye industry in this and other countries in 1914. "The German monopoly of the world's dye production has been temporarily if not permanently broken," says the report. The United States, Great Britain and France now each produces more than 80 per cent of its own requirements. Each has exported significant quantities of dyes since the signing of the Armistice, and as a result of their war experiences, each will doubtless make strong efforts to retain the ground it has gained in the dye field.

China leads all nations as a consumer of dyes with approximately 70,000,000 pounds per year; the United States ranks second with 55,000,000 pounds and Great Britain, third with an average of 50,000,000 pounds per year. At this place the Census report says:

"It is anticipated that Germany will make every endeavor to recover a part of her large dye trade in these markets during the coming years.

"Severe competition may be expected in the world's dye market as a result of the large developments during and since the war."

With the variety and quality as well as the quantity of dyes produced in this country steadily increasing, and with the current prices lower than they have been since 1917, the next move ought to be toward increased activity in foreign fields. No more opportune circumstances for the development of export business in American dyestuffs could be asked for than those existing at the present time. It is to be hoped that American manufacturers will develop the opportunity to the maximum.

THE CHEMICAL FOUNDATION SUIT

Oral argument in the case of the Government against the Chemical Foundation, regarding the recovery of German dye patents, was held before Judge Morris in the Federal Court at Wilmington on October 8, 9 and 10. Nothing of a startling nature and, in fact, very little that was new was injected into the argument by either side.

Summing up for the Government Colonel Henry W. Anderson stressed the section of the Penal Code which makes it a crime for an officer of the Government to enter into contracts involving financial considerations between the Government and another party with which the officer in question is identified. Colonel Anderson laid great emphasis upon the fact that Mr. Garvan, while Alien Property Custodian, negotiated the sale of the patents to the Chemical Foundation of which he was President. He also maintained that President Wilson exceeded his powers in deputizing Mr. Garvan through Mr. Polk to make the sale in question.

Isidor J. Kresel, counsel for the Foundation, replying to Colonel Anderson maintained that if criminal liability could be charged to Mr. Garvan it could equally as well be charged against Mr. Polk and President Wilson, by whose express direction Mr. Garvan acted.

Mr. Kresel further contended that the entire action of the Government in attacking the sale clearly tends to aid the German dye industry to retain its monopoly of the world's trade. He insisted that Congress had a purpose in view when it passed upon the sale of the patents, namely, that of providing a measure of national defense in the event of future war. Congress knew that it was placing a weapon of inestimable value at the disposal of America when it approved any act beneficial to our dye industry. It was merely using rare foresight resulting from certain enlightening experiences that had been brought forcibly to its notice back in 1914.

During the course of the argument it was arranged that the counsel for both the plaintiff and the defendant should have an opportunity to submit supplementary briefs, and Judge Morris later set October 29 as the date for filing such a brief by the Foundation and November 7 as the date for filing by the Government.

It is generaly anticipated by the partisans of both sides that a decision will not be rendered until nearly the first of the year, and the belief is further expressed that no matter which side is sustained an appeal to the United States Supreme Court will be taken. If this should prove to be the case, it may be a matter of years before a final decision will be handed down.

MEETING OF SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS' ASSOCIATION

The October meeting of the Dyes Section of the Synthetic Organic Chemical Manufacturers Association was held in Wilmington, October 7, 8 and 9.

Sunday, October 7, was given over to a golf tournament under the direction of A. H. Pierce. Monday morning and afternoon were spent in court listening to the argument of the Government's suit against the Chemical Foundation. Monday evening there was an informal dinner followed by a business meeting at which August Merz, of The Heller & Merz Company, was elected chairman of the Dyes Section to succeed Fred E. Signer, recently deceased. Albert J. Farmer, of the Pharma-Chemical Corporation, was elected a member of the Board of Directors to succeed Mr. Merz.

Tuesday afternoon the members visited the dyestuff laboratories and the semi-commercial plant of the Du Pont Company at Deepwater, and in the evening were the guests of the Du Pont Company for dinner at the Du Pont Hotel. The committee in charge of arrangements for the meeting consisted of Messrs. Van Riper, MacKinnon and Pierce.

Foreign Dyes Imported Through the Port of New York During September

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Amniersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux. of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Geselfschaft fur chemische Industrie. Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

BAC—The British Alizarin Co., Ltd. Established 1882.
ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1820. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
Q—Importations of unknown source, through dealers in colors.

THE imports of coal-tar dyes for September totaled 124,665 pounds, with an invoice value of $128,544. The following table shows the monthly imports through the port of New York for the year 1923:

Month	Pounds	Value
January*	179,309	$185,344
February	191,709	199,690
March	312,809	301,436
April	242,022	256,751
May	261,869	292,340
June	247,174	257,803
July	144,687	142,428
August	178,164	194,164

*Not complete.

The five dyes leading in quantity imported were Gallamine Blue, Trisulphon Brown GG, Diaminogene Blue, Phosphine, and Xylene Light Yellow. Of the total quantity imported in September, 1923, 44 per cent came from Germany, 36 per cent from Switzerland, 14 per cent from Italy, 4 per cent from France and 2 per cent from other countries.

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced to a single-strength basis.

The designation "†" for competitive and "" for non-competitive in column 1 indicates the appraisement basis for the assessment of the ad valorem duty in paragraph 28 of the Tariff Act of 1922. Those dyes without designation are doubtful, pending further investigations.*

The ad valorem rate for competitive dyes is based on the American selling price as defined in Subdivision (f) of Section 402 of Title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in Subdivision (d) of Section 402 of Title IV of the Tariff Act of 1922.

The imports of color lakes for September totaled 1,010 pounds, with an invoice value of $446. The imports of synthetic organic chemicals for September totaled 5,530 pounds, with an invoice value of $11,692; and the imports of medicinals, photographic developers and other coal-tar chemicals totaled 10,003 pounds, with an invoice value of $5,835.

The regular monthly import lists for September follow:

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
22	Xylene Light Yellow	5,000
	†Xylene Light Yellow 2G Conc.—(S)	
34	Chrysoidine R	20
	Chrysoidine RL Base—(B)	
81	Brilliant Cochineal	50
	Pilatus Scarlet A—(B)	
121	Erica B	1,045
	Erica B Extra—(A)	
	Cotton Pink BN—(Q)	
122	Erica G	45
	Cotton Pink GN—(Q)	
140	Curcumeine	1,042
	*Chromocitronine R—(DH)	
	Jasmine, High Conc.—(G)	
160	Fast Brown	1
	Naphthylamine Brown—(B)	
161	Fast Red	65
	Fast Red AV—(B)	
193	Clayton Cloth Red	300
	Stanley Red—(ClCo)	
207	Diphenyl Fast Brown G	2,425
	Diphenyl Fast Brown GNC—(G)	
220	Palatine Black	4,000
	Wool Black GRF—(A)	
273	Diaminogene Blue	5,651
	*Diaminogene Blue NA—(C)	
	Diazamine Blue NA—(Q)	
	Blue NA—(C)	
	Blue NBB—(C)	
274	Diaminogene	849
	Diaminogene Extra—(C)	
296	Cotton Yellow	417
	Cotton Yellow GX—(B)	
	Benzo Fast Yellow RL—(By)	
319	Diamine Scarlet	400
	Diamine Scarlet 3B—(C)	
358	Diphenyl Red	352
	Chloramine Red 8BS—(B)	
	Acetopurpurine 8B—(A)	
360	Pyramine Orange R	3,000
	Ignamine Orange R—(B)	
405	Benzopurpurine 10B	100
	†Benzopurpurine 10B Conc.—(S)	
449	Trisulfon Brown	2,039
	Trisulfon Brown B Conc.—(S)	
456	Benzo Fast Blue	999
	Benzo Fast Blue 4GL—(By)	
457	Trisulfon Brown GG	6,005
	Trisulfon Brown 2G Conc.—(S)	
500	Setocyanine	662
	*Setopaline Conc. 707—(G)	
503	Neptune Green	500
	Brilliant Milling Green B—(C)	
506	Erioglaucine	2,205
	Erioglaucine AP 545—(G)	
518	Ethyl Purple	50
	Ethyl Violet—(Q)	
521	Aniline Blue	22
	Night Blue Greenish D—(G)	
522	Victoria Blue 4R	441
	Victoria Blue 4R—(I)	
539	Soluble Blue	50
	Cotton Blue 2 Conc.—(M)	
546	Cyanol	1,000
	Cyanol Extra—(C)	
559	Victoria Blue B	1,000
	Victoria Pure Blue BO—(B)	
568	Pyronine G	55
	Pyronine G—(L)	
569	Acridine Red	55
	Acridine Red 3B—(L)	
573	Rhodamine B	111
	†Rhodamine B Extra Conc.—(Q)	
603	Acridine Orange	110
	Rhoduline Orange NO—(By)	
606	Phosphine	5,205
	†Patent Phosphine G—(I)	
	Phosphine 3R—(A)	
607	Rheonine	25
	Rheonine AL Conc.—(B)	
608	Euchrysine	1,000
	Euchrysine RRDX—(B)	
617	Columbia Yellow	210
	Diamine Fast Yellow AGG—(C)	
	Diphenyd Chlorine Yellow FF Supra G	
618	Thioflavine T	500
	Basic Yellow T—(C)	
637	Gallamine Blue	10,362
	*Gallamine Blue Extra Paste—(G)	
653	Nile Blue	10
	Danubia Blue BBX—(B)	
659	Methylene Blue	5
	Methylene Blue 3G—(B)	
663	New Methylene Blue	2,005
	*New Methylene Blue N—(C)	
	Methylene Blue NNX—(B)	
681	New Fast Gray	1,102
	Malta Gray J—(P)	
759	Anthraflavone G (single strength)	1,003
	Anthraflavone GC Paste—(B)	
760	Indan. Gldn. Orange G (sgle. stngth)	1,350
	Indan. Gldn. Orange G Dbl. Pst.—(B)	
	Indan. Gldn. Orange G Pst.—(Q)	
761	Indan. Gldn. Orange R (sgle. stngth.)	4,157
	*Indan. Gldn. Orange RRT Pst.—(B)	
762	Indan. Scarlet GS (sgle. stngth)	68
	Indan. Scarlet GS Pdr.—(B)	
767	Indan. Violet RR (sgle. stngth.)	176
	Indan. Violet RR Ex. Pdr.—(B)	
768	Indan. Violet BN	865
	Indan. Violet BN Ex. Pst.—(B)	

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
779	Alizarine Orange	10
	Alizarine Orange A—(B)	
780	Alizarine Red	1,321
	Alizarine Red S Powder—(B)	
794	Cibanone Black	1,102
	Cibanone Black B Paste—(I)	
804	Alizarine Blue S.....	612
	Alizarine Blue S Powder—(Q)	
822	Algol Brilliant Orange FR (sgle. stngth.)	264
	Algol Brilliant Orange FR Pdr.—(By)	
827	Indan. Claret B Extra.....	1,021
	Indan. Bordeaux B Ex. Pst.—(B)	
828	Indan. Claret B (sgle. stngth.).....	880
	Indan. Claret B Pdr.—(B)	
831	Indan. Red BN.....	1,298
	Indan. Red BN Paste—(B)	
	Indan. Red RK Paste—(B)	
838	Indan. Blue RS (sgle. stngth.).....	3,300
	Indan. Blue RS Triple Powder—(B)	
847	Algol Green B.....	200
	Vat Green BB Paste—(By)	
853	Anthraquinone Violet Powder—(B).....	40
854	Alizarine Viridine	999
	Alizarine Viridine FF Paste—(By)	
855	Alizarine Pure Blue B.....	559
	*Alizarine Sky Blue B Powder—(By)	
856	Alizarine Astrol	1,298
	Alizarine Astrol B Powder—(By)	
858	Alizarine Saphirol B.....	1,975
	Alizarine Blue SAWSA—(By)	
	Alizarine Light Blue B Conc.—(S)	
860	Cyananthrol G	924
	Cyananthrol BGA—(B)	
	Cyananthrol BGAOO Powder—(B)	
862	Alizarine Blue Black.....	441
	†Alizarine Blue Black B—(By)	
865	Alizarine Direct Green G.....	220
	Alizarine Cyanine Green G—(By)	
869	Algol Brown R.....	55
	Algol Brown R Paste—(By)	
870	Algol Corinth R (single strength).....	496
	Algol Corinth R Powder—(By)	
893	Alizarine Indigo G (single strength).....	275
	Alizarine Indigo G Powder—(By)	
901	Ciba Violet B.....	2,205
	Ciba Violet B Paste—(I)	
904	Helindone Brown G.....	220
	Helindone Brown G Paste—(M)	
907	Ciba Scarlet (single strength).....	1,438
	Helindone Fast Scarlet C Paste—(M)	
	Thioindigo Scarlet 2G Paste—(K)	
908	Ciba Red R.....	661
	*Ciba Red R Paste—(I)	
910	Helindone Pink	55
	Helindone Pink AN Paste—(M)	
913	Helindone Orange R (single strength)...	2,585
	Helindone Fast Scarlet R Paste—(M)	
	Thioindigo Orange R Powder—(K)	
915	Helindone Fast Scarlet R.....	40
	Helindone Fast Scarlet R Paste—(M)	
918	Helindone Red 3B.....	1,100
	Helindone Red 3B Paste—(M)	
919	Ciba Bordeaux B.....	1,102
	Ciba Bordeaux B Paste—(I)	
923	Ursol	405
	Fur Blue Black A (Ursol A)—(A)	
	Fur Blue Gray (Ursol 113567)—(A)	
	Fur Brown (Ursol NZ)—(A)	
	Fur Gray R (Ursol Gray R)—(A)	
	Fur Gray B (Ursol Gray B)—(A)	
	Fur Yellow Brown—(A)	

UNIDENTIFIED ACID DYES

Name of Dye and Manufacturer	Quantity (pounds)
Brilliant Milling Blue B—(C).....	2,210
Brilliant Milling Red R—(C).....	300
Erio Fast Cyanine S Conc.—(G).....	220
Erio Fast Fuchsine BL Conc.—(G).....	110
Erio Fast Violet RMS Conc.—(G).....	55
Guinea Brown	150
Guinea Brown GL—(A)	
Guinea Brown 2GL—(A)	
Guinea Brown R—(A)	
Guinea Brown RD—(A)	
Guinea Brown 2R—(A)	
Guinea Brown 2RD—(A)	
Guinea Fast Red 2R—(A).....	225
Guinea Rubine 4R—(A).....	10
Milling Brown 3G, R—(A).....	10
Palatine Light Yellow RX—(B).....	1,000
Polar Yellow 5G Conc.—(G).....	1,473
Sulphon Acid Brown 2R—(By).....	33
Supramine Black BR—(By).....	221
Supramine Brown R—(By).....	132

UNIDENTIFIED VAT DYES

Name of Dye and Manufacturer	Quantity (pounds)
Algol Brown G (single strength).....	440
Algol Brown G Powder—(By)	
Ciba Pink	882
Ciba Pink B Paste—(I)	
Ciba Pink BG Paste—(I)	
Hydron Bordeaux (single strength).....	8
Hydron Bordeaux B Double Paste—(C)	
Hydron Bordeaux R Double Paste—(C)	
Hydron Green B Paste—(C).....	2
Hydron Olive	302
Hydron Olive GN Paste—(C)	
Hydron Olive R Paste—(C)	

Name of Dye and Manufacturer	Quantity (pounds)
Hydron Pink FF Paste—(C)	440
Hydron Scarlet	2,501
*Hydron Scarlet 2B Paste—(C)	
*Hydron Scarlet 3B Paste—(C)	
Hydron Violet	552
Hydron Violet B Paste—(C)	
Hydron Violet R Powder—(C)	
Vat Brilliant Violet (sgle. stngth.)	4,000
Vat Brilliant Violet RRP Powder—(B)	

UNIDENTIFIED MORDANT AND CHROME DYES

Name of Dye and Manufacturer	Quantity (pounds)
*Acid Alizarine Gray G—(M)	1,906
Alizarine Cyclamine R Paste—(By)	398
Alizarine Rubinol	221
Alizarine Rubinol GW Powder—(By)	
*Alizarine Rubinol 3G Powder—(By)	
*Alizarine Rubinol R Powder—(By)	
Anthracene Chromate Brown EB—(C)	108
†Azorhodine 2G Conc.—(S)	200
Chromanol Blue NR Powder—(DH)	550
Chrome Violet C 3BD—(DH)	110
Chromorhodine BN—(DH)	110
Eriochrome Green L—(G)	110
Metachrome Brilliant Blue BL—(A)	5
Metachrome Green 3G—(A)	5
Metachrome Olive D—(A)	5
Omega Chrome Brown G Conc.—(S)	1,944
Ultra Cyanol B Conc.—(S)	600

UNIDENTIFIED DIRECT DYES

Name of Dye and Manufacturer	Quantity (pounds)
Benzo Fast Brown 3GL—(By)	499
*Benzo Fast Heliotrope 5RH—(By)	55
Benzo Fast Orange 2RL—(By)	200
†Benzo Fast Orange S—(By)	221
Brilliant Sky Blue 8G—(By)	73
Diamine Aldehyde Bordeaux B—(C)	2
Diamine Azo Fast Green G—(C)	2
Diamine Catechine G—(C)	102
Diamine Fast Brown G, GB—(C)	4
Diamine Fast Orange ER—(C)	1,000
Diamine Fast Scarlet CBS—(C)	100
*Diamine Orange B—(C)	500
Diamine Yellow N Powder—(C)	2
Dianil Light Red 8BL—(M)	500
Diazo Brilliant Green 3G—(By)	55
*Diazo Brilliant Scarlet 6B Extra—(By)	221
Diazo Brown 3RB—(By)	24
Diazo Fast Violet 3RL—(By)	32
Diazo Indigo Blue 4GL Extra—(By)	220
Diphenyl Fast Bordeaux G Conc.—(G)	110
Fast Light Red BL—(By)	499
Oxamine Black	80
Minaxo Black BBN—(B)	
Minaxo Black BBNX—(B)	
Oxamine Fast Pink BX—(B)	5
Triazol Red 3B—(GrE)	331
†Zambesi Black V—(A)	2,000

UNIDENTIFIED BASIC DYES

Name of Dye and Manufacturer	Quantity (pounds)
Acridine Scarlet J—(DH)	55
Black D (Janus Black)—(B)	5

UNIDENTIFIED SULPHUR DYES

Name of Dye and Manufacturer	Quantity (pounds)
Sulphur Brilliant Blue GLB—(A)	500

UNIDENTIFIED COLOR LAKES

Name of Dye and Manufacturer	Quantity (pounds)
Japan Black Extra—(B)	275
Yellow II—(B)	15

UNIDENTIFIED AND UNCLASSIFIED DYES

Name of Dye and Manufacturer	Quantity (pounds)
Violet Red HR—(P)	220

COLOR LAKES OF COAL-TAR ORIGIN

Name of Chemical	Quantity (pounds)
Bismarck Brown AV	624
Rose Madder	44
Viridine Lake 1028H	342

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, OF THE AMERICAN DYESTUFF REPORTER.

Published biweekly at New York, N. Y., for October 1, 1923.

State of New York, County of New York, ss.: Before me, a notary public in and for the State and county aforesaid, personally appeared Alfred P. Howes, who, having been duly sworn according to law, deposes and says that he is the publisher of the American Dyestuff Reporter and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor and business managers are:

Publisher—Alfred P. Howes, 4109 Woolworth Building, New York City. Editor—Louis A. Olney, Lowell, Mass. Managing Editor—None. Business Manager—Alfred P. Howes, 4109 Woolworth Building, New York City.

2. That the owners are: Howes Publishing Co., Inc., 4109 Woolworth Building, New York City; Louis A. Olney, Lowell, Mass.; Alfred P. Howes, 4109 Woolworth Building, New York City; Derfla H. Collins, Upper Montclair, N. J.; Mary K. Howes, Northampton, Mass.; N. H. Hiller, Carbondale, Pa.; William F. Collins, Upper Montclair, N. J.; Jos. L. Schroeder, Hartsdale, N. Y.

(*Concluded on page 790*)

A Modern Dyehouse

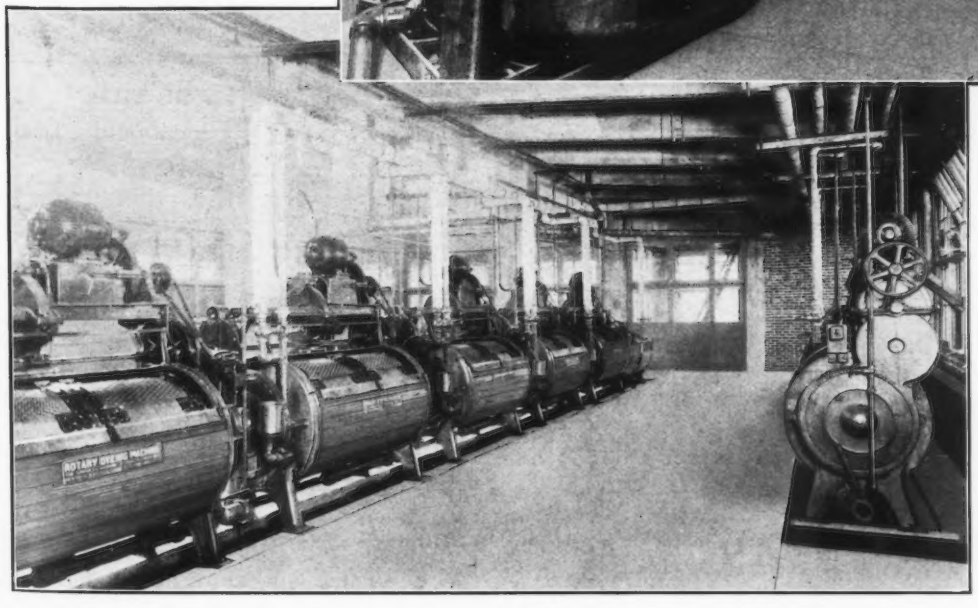
Improved Conditions and Progress Evident in New Dyehouse of Gotham Silk Hosiery Co., New York

CLOSE observation of the illustrations of the new dyehouse of the Gotham Silk Hosiery Company, Inc., New York City, shows the great progress being made by progressive organizations in constructing dyehouses to better suit the present demands. Both work and working conditions are improved by these progressive methods.

The dyehouse has ample daylight and perfect ventilation. Water supply lines, both hot and cold, are of ample size to prevent any shortage, and steam is provided by two large capacity boilers. The dyehouse floor is of waterproof concrete, with gutters underneath the machines for quick and effective removal of drainage.

For efficient operation the dyehouse floor is divided into four departments, each one separated from the other by partitions, the upper half of which is glass to prevent any reduction in the free daylight available. The single-pair dyeing department occupies one space, while a drug room and laboratory form the adjoining department. The bleach department is in a separate room, with connecting doors to the dyehouse. The main dyehouse is large and spacious, yet permits efficient operation with the smallest possible waste of steps on the part of the operators.

A large number of Monel-metal rotary dyeing machines are used to comply with the demand made on this firm. The Gotham company has enjoyed a very wonderful reputation for supplying the latest shades on short notice. The maintenance of this reputation necessitated equipment would would dye all colors



Above—Battery of 2-48-in. Humatic Extractors in Dyehouse of Gotham Silk Hosiery Co., New York.

Left — Sectional view of dyehouse showing batteries of all Monel Metal Rotary Dyeing Machines.

and handle a great variety of shades very rapidly.

The American rotary dyeing machines permit a quick change from one color to another. Only a slight wash-out is needed to make the machines ready for the next lot of an entirely different shade. The finish and appearance of the goods do not suffer from the use of these modern machines, but the "silk finish" of the machines actually preserves the wonderful luster of the high-quality silk used.

To remove the surplus water from the dyed goods, Humatic hydro-extractors are used. These machines permit an accurate and automatic timing of the load, insuring proper amount of moisture left in the goods for the boarding of the hosiery. Safety for the operator has been given exceptional thought by the management of this mill, and the positive safety cover of the centrifugal machines is but one of the numerous appliances that have found practical application in this model plant.

STATEMENT OF OWNERSHIP

(*Concluded from page 788*)

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds or other securities than as so stated by him.

A. P. Howes, Publisher.

Sworn to and subscribed before me this 25th day of September, 1923

[Seal] Robert H. Thomson.

(My commission expires March 30, 1925.)

NEW TARIFF INCREASES LITIGATION

Since the present tariff law became effective September 21, last year, litigation over customs duties, particularly at New York, has increased enormously, Attorney-General Daugherty has announced, after reviewing a report of William W. Hoppin, assistant attorney-general in charge of the customs division, Department of Justice. By enlarging the jurisdiction of the Board of General Appraisers, the law has added the litigation passing through the New York office, the attorney-general says. He ascribes the increased imports to the general revival of business, and the consequent increased amount and variety of imports. The number of cases filed with the board has increased 100 per cent. High tariff duties also increase litigation, because recovery of these duties means more to the importer than the recovery of low duties.

It is important, the attorney-general says, that business interests have as thorough an interpretation of the act as possible, particularly when a change in rate is sought.

A clear, bright blue direct dye of a reddish shade, meant especially for use on all classes of cotton goods where resistance to sunlight is of prime importance, has been brought out by one of the big domestic producers of colorstuffs. It is said also to be of value in dyeing paper because of its light-resisting qualities. This color was imported from Europe before the war and was regarded as very important because of its fastness to sunlight without the necessity of after-treatment. A wide market for it exists here.

Professor Kalb, of Munchen, announces that the shade of a dye, with other properties, can be frequently changed with profit. For example, from the usual reddish blue Indigo is obtained pure blue and greenish blue chlorine and bromine derivatives. It is now possible, through high "iodination," to change the color of indigo still more, so that a pure green is obtained. The product obtained by the halogenation of indigo to green is of particular interest because only a very few green vat dyes are generally known. A simple process could be worked out for the production of high-iodinated indigoes.

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11,000	"	Sulphur Green
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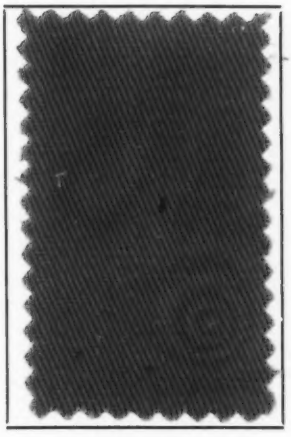
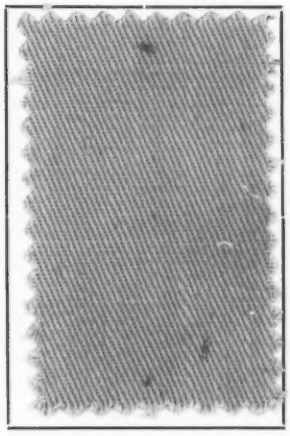


2 lbs. Sulphur Fast Green B



1 lb. Sulphur Fast Yellow G

The proportions are for 100 lbs. material
Dyed in jigger

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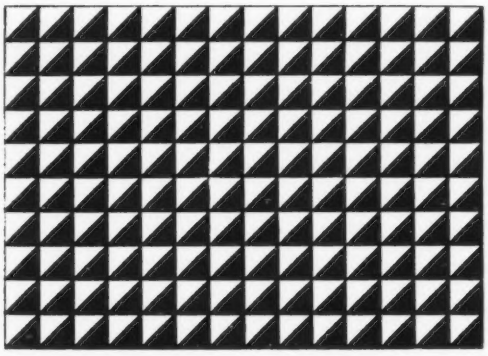

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